SEVENTEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF AGRICULTURE

OF THE

STATE OF MICHIGAN.

For the Year Ending August 31, 1878.

LANSING:
W. S. GEORGE & CO., STATE PRINTERS AND BINDERS.
1878.

State Board of Agriculture.

Hon. HEZEKIAH G. WELLS, of Kalamazoo,

PRESIDENT OF THE BOARD.

Hon. J. WEBSTER CHILDS, of Ypsilanti,

VICE PRESIDENT.

Hon. GEORGE W. PHILLIPS, of Romeo.

Hon. FRANKLIN WELLS, of Constantine.

Hon. A. SMITH DYCKMAN, of South Haven.

Hon. MILTON J. GARD, of Volinia.

CHAS. M. CROSWELL, Governor of the State, } *Ex Officio.*
T. C. ABBOT, President Agricultural College, }

ROBERT G. BAIRD, Secretary.

EPHRAIM LONGYEAR, of Lansing, Treasurer.

REPORT OF THE SECRETARY

OF THE

STATE BOARD OF AGRICULTURE.

AGRICULTURAL COLLEGE,
Lansing, August 31st, 1878.

To the Legislature of the State of Michigan:

I have the honor to submit herewith to your Honorable Body, as required by statute, the accompanying Report for the year ending August 31st, 1878, with supplementary papers.

Respectfully yours,

ROBERT G. BAIRD,

Secretary of Mich. State Board of Agriculture.

COLLEGE ACCOUNTS.

SECRETARY'S ACCOUNT,

From October 1, 1877, to August 31, 1878.

Dr.			
To balance on hand October 1st, 1877		$178 74	
received from State Treasurer on account of new dormitory hall	$12,765 97		
repairs of buildings, furniture and steam works	3,305 57		
Chemical department	602 07		
Library	890 00		
Museum	480 00		
Improvement of Cedar river	127 50		
Horticultural department	772 30		
Farm department	1,686 81		
Interest (land grant fund)	13,570 61		
Institutes	335 70		
Current expense	4,612 50		
		39,147 03	
receipts from Farm department		5,115 62	
Horticultural department		1,577 72	
Mechanical department		157 48	
Boarding hall (exclusive of students' board)		477 76	
Farm house (board of employés)		1,244 83	
Sale of swamp lands		826 60	
Sale of brick		373 92	
New hall (sale of stone)		282 38	
Museum (sale of articles)		9 25	
R. C. Kedzie (sale of chemicals)		9 95	
Library		118 89	
Apiary		314 52	
Students on acct. of diplomas	$75 00		
extra chemicals	95 30		
incidentals	713 25		
room rent	381 25		
matriculation fees	330 00		
board	6,399 73		
		7,994 53	
special examinations		45 00	
Cr.			
By cash paid E. Longyear, treasurer			$57,859 27
balance Sept. 1st, 1878			16 95
		$57,876 22	$57,876 22

SUMMARY OF TREASURER'S ACCOUNT.

DR.

To balance Oct. 1, 1877	$1,547 85	
cash of Secretary and State Treasurer from Oct. 1st, 1877, to August 31st, 1878	57,859 27	

CR.

By warrants paid		$58,525 75
balance to new account		881 37
	$59,407 12	$59,407 12

The Treasurer's account, of which the above is a correct summary, is on file in my office.

R. G. BAIRD, *Secretary.*

SUMMARY OF WARRANT ACCOUNT.

Expense of State Board		$312 70
President's office		80 97
Secretary's office		222 93
Advances refunded		1,636 15
Salaries		15,523 72
College Hall		94 97
Sunday services		85 00
Grounds		1,203 53
New Grade		121 15
Printing		336 61
Students' labor (paid by warrant)		27 35
Apiary		126 82
Current expense (incidentals)		155 85
Board of employés (other than hired men)		458 62
State Fair (expense of exhibiting, fair of 1877)		21 50
Cuts for Reports		30 00
Diplomas		150 00
Armory		10 11
Mechanical department		187 96
Farm House		1,121 21
Boarding Hall		10,577 84
Library current expense	$151 63	
special appropriation	830 21	
		981 84
Chemical department, current expense	151 02	
special appropriation	697 59	
		848 61
Farm department, current expense	$3,070 18	
special appropriation	1,369 63	
		4,439 81
Horticultural department, current expense	$1,546 41	
special appropriation	705 75	
		2,252 16
Museum, special appropriation		346 52
Steam Works, etc. (appropriation for 1875 and 1876)		552 16
Buildings, repairs, etc.,		3,049 68
Farmers' Institutes		335 70
Fire Extinguishers		250 00
Improvement of Cedar river		35 93
New Dormitory Hall		12,948 35
		$58,525 75

DEPARTMENT ACCOUNTS.

FARM DEPARTMENT

In Account with Agricultural College.

Dr.

To disbursements on account of current expense—		
Cattle	$468 75	
Hogs	107 90	
Sheep	76 72	
Labor	1,227 16	
Lumber	113 20	
Office	50 23	
Implements	227 94	
" repairs of	59 51	
State Fair (expense of exhibiting, 1877)	3 25	
Teams	126 07	
Seeds	36 47	
Hardware	24 06	
Blacksmithing	6 10	
Fertilizers	20 76	
Board of hired men	482 44	
Miscellaneous	39 62	
Total	$3,070 18	
Special appropriation (for drainage)	1,369 63	
Students' Labor	3,100 68	
Decrease of Inventory	1,976 82	

Cr.

By cash receipts on account of breeding cattle	$285 00
Milk, beef, hides, etc	1,205 17
Bull service	25 00
Wool	177 10
Mutton, sheep, pelts, etc	175 05
Breeding sheep	10 00
" hogs	133 00
Pork	90 21
Boar service	11 00
Hay	69 36
Oats	145 36
Lumber	6 41
Hardware	2 85
Potatoes	70 86
Wheat	725 96
Screenings	30
Corn	11 50
Straw	13 95
Seeds	30 35
* Men and team labor	640 86
Students' labor	880 23
Implements	45 60
Turnips	5 70
Wood	267 31
Brick	6 79
Salt	1 56
Ground fence	6 36
Plaster	80
Team account	60 63
Implements, repairs of	4 35
Fertilizers	7 00
Total	$5,115 62

* This item includes $78.00 paid by C. & N. E. R. R. Co. for building fence along their road.

Inventory transferred to mechanical department		$93 28
Balance		4,308 41
	$9,517 31	$9,517 31

HORTICULTURAL DEPARTMENT

In Account with Agricultural College.

Dr.

To disbursements on account of current expense—		
Greenhouse	$415 75	
Labor (other than students)	272 46	
Office	25 22	
Team	292 30	
Vegetable garden	63 14	
Nursery	19 12	
Grounds	70 54	
Orchard	21 46	
Experiments	66 84	
Botanical Museum	1 15	
Lumber	9 90	
Miscellaneous	24 28	
Implements	86 44	
Seeds	6 00	
Grapery	17 50	
Fertilizers	11 03	
Board of men	143 28	
Total	$1,546 41	
Special appropriations	705 75	
Students' labor	1,493 30	

Cr.

By cash receipts—		
on account of Greenhouse		$278 00
Vegetable garden		225 91
Team		342 13
Labor		674 27
Orchard		3 50
Shop, lumber, etc.		12 31
Compost		27 03
Tools		9 70
Old iron (sold)		4 87
Total		$1,577 72
To increase of inventory		97 67
balance		2,070 07
	$3,745 46	$3,745 46

FARM HOUSE

In Account with Agricultural College.

Dr.

To bills receivable of 1877	$121 24	
cash disbursements	1,121 21	
decrease of inventory	22 82	

Cr.

By cash (board of employés)		$1,244 83
balance		20 44
Totals	$1,265 27	$1,265 27

LIBRARY

In Account with Agricultural College.

Dr.		
To cash disbursements—		
on account of special appropriations	$830 21	
cash current expense	151 63	
students' labor	100 35	
Cr.		
By cash receipts (sales)		$118 89
increase of inventory (by donations and purchase)		947 01
balance		16 29
Totals	$1,082 19	$1,082 19

CHEMICAL DEPARTMENT

In Account with Agricultural College.

Dr.		
To cash disbursements—		
on account of special appropriations	$697 59	
cash, current expense	151 02	
Cr.		
By cash of R. C. Kedzie		$9 95
students		95 30
increase of inventory		431 53
balance		311 83
Totals	$848 61	$848 61

MUSEUM

In Account with Agricultural College.

Dr.		
To cash disbursements—		
on account of special appropriation	$346 52	
students' labor	23 70	
balance	90 67	
Cr.		
By cash (sale of articles)		$9 25
increase inventory (purchase and donation)		451 64
Totals	$460 89	$460 89

APIARY

In Account with Agricultural College.

Dr.		
To cash disbursements	$126 82	
students' labor	34 22	
decrease of inventory	184 45	
balance	8 18	
Cr.		
By cash		$314 52
transfer of inventory to Mechanical Department		39 15
Totals	$353 67	$353 67

MECHANICAL DEPARTMENT

In Account with Agricultural College.

To inventory transferred from Apiary	$39 15	
" " " Farm Department	93 28	
cash disbursements	187 96	
students' labor	26 00	
Cr.		
By cash		$157 48
inventory		163 29
balance		25 62
Total	$346 39	$346 39

BOARD.

The summary of warrant account shows the disbursements on account of board, and the Secretary's account shows the amount of cash received from students on account of board till August 31st. Students are boarded at cost. The cash received from them on account of board is simply the balance which they are indebted to board after being credited with the amount of their labor. Board, including fuel, cost during the autumn term, $2.45; spring term, $2.40; summer term, $2.10. An average for the year of two dollars thirty-one and two-thirds cents per week.

STUDENTS' LABOR.

The several departments have been charged, and the students have been credited, during the year with labor as follows:

DEPARTMENT.	No. of Hours.	Amount.
Farm Department	31,289	$3,100 68
Horticultural	15,020	1,493 30
President's office	161½	16 15
Secretary's office	215¾	21 57
Library	1,003½	100 35
Buildings	795	79 50
Organ	168	16 80
Museum	237	23 70
Bell	577	57 70
Mail	802	80 20
Apiary	342¼	34 22
Botanical Museum	321	32 10
Surveying and Map Drawing	169	16 90
Mechanical Department	260	26 00
	51,361	$5,099 17

SUMMARY OF INVENTORY.

BUILDINGS.

College hall	$15,000 00	
Chemical laboratory	12,000 00	
Williams hall	45,000 00	
Wells hall	25,000 00	
Farm house	3,500 00	
Two brick cottages	6,000 00	
One brick cottage	4,000 00	
One brick cottage	3,400 00	
Herdsman's cottage	600 00	
Six barns at Professors' houses	1,800 00	
Horticultural barn and shed	1,100 00	
Cattle barn and shed	3,200 00	
Sheep barn	2,500 00	
Horse barn	3,000 00	
Piggery	2,000 00	
Brick work-shop	600 00	
Blacksmith shop, tool house, feeding house	400 00	
Windmills, water supply, etc.	500 00	
Three new houses (President's and two frame houses)	20,728 00	
Greenhouse	8,000 00	
Bee house	280 00	
		$158,608 00
Twelve fire extinguishers		500 00

INVENTORY OF FARM.

676 acres @ $70 per acre		47,320 00
Farm department—horses	$1,105 00	
cattle	6,210 00	
sheep	816 00	
swine	697 00	
machinery and steam power	1,488 00	
implements, tools, miscellaneous	2,523 25	
offices, produce, etc.	4,072 02	
		16,911 27
Horticultural department—greenhouse, plants, fuel, etc.	$3,599 60	
team, implements, produce, etc.	2,516 35	
		6,115 95
Farm house—furniture, produce, etc.		673 99
Chemical department—apparatus, chemicals, etc.		5,790 72
Library—books, pamphlets and furniture		10,440 68
General museum—specimens, cases, etc.		5,644 00
Apiary—bees, tools, honey, etc.		434 25
Department of Mathematics and Civil Engineering—models, surveying, apparatue, etc		5,523 00
Mechanical Department—tools, lumber, etc.		163 29
Boarding Hall—furniture, provisions, etc.		3,119 34
Furniture in chapel and recitation rooms—stoves, seats, tables, etc.		735 70
President's office—furniture, stationery, etc.		201 91
Secretary's office—safe, furniture, stationery etc.		584 00
Botanical Museum—specimens, microscopes, etc.		4,851 60
Total		$267,617 70

SUPPLEMENTARY STATEMENT OF THE SECRETARY.

The College year now commences with the Autumn term, which begins during the first week of September, and closes with the Summer term, which ends in the last week of August. It is much more convenient and satisfactory to make the fiscal year correspond with the College year. A resolution was therefore adopted by the State Board of Agriculture instructing the Secretary and other officers of the College to report on the 31st of August. In consequence of this change, the foregoing statement of receipts and expenditures for the fiscal year ending August 31st, covers a period of eleven months only.

At the close of the fiscal year all bills against the College rendered to the Secretary were paid; also the salaries of the several officers and employés.

The special appropriations made to the College for the years 1877–8 have all been drawn from the State Treasury. The following balances of these appropriations are yet to be expended:

Buildings, furniture, and repairs	$187 21
Farm department	217 95
Library	110 78
Chemical department	12 65
Museum	87 04
Horticultural department	42 95
Improvement of Cedar River	91 57
Total unexpended of special appropriations Aug. 31st, 1878	$750 15

These balances will probably be all expended before the close of the calendar year 1878, as purchases and improvements have been authorized by the Board which are much needed, even on a more extended scale, but are authorized only under limitations that will not allow the expenditure to go beyond the appropriations.

From the nearest approximate estimate that we can make of the current expenses of the College for the four months of the calendar year yet remaining, and a similar estimate of the resources available to meet these expenses, I feel confident that we shall be able to pay all demands up to January first, 1879; thus closing the year without debt, although the receipts from the Congressional Land Grant fund for the years 1877–8 have fallen short of the amount estimated for these years about three thousand dollars.

Permit me to suggest in connection with this statement of the general financial condition of the College, that there being no provision for its expenses after the first of January, 1879 (except the interest from the land grant fund. none of which will be available for that year till April 1st), until an appropriation is made by your Honorable Body, it is exceedingly desirable either that the appropriation for the College should be passed as early in the session as possible, or that a law should be enacted allowing the College to draw from the State Treasury for its current expenses at the same rate as provided for the two previous years until the appropriation is made.

In the accounts of the Farm Department as presented in this report, the excess of the debits over the credits is much larger than in former years, but it should be noticed also in connection with this that the cash receipts are considerably in excess of the actual cash disbursements.

The chief causes of the heavy balance against the Farm Department are: 1st, The depreciation of property represented in the inventory,—specially heavy in the one item of blooded stock; 2d, The unusually large amount charged to the farm on account of students' labor, occasioned by the increased number of students.

With regard to the former, the depreciation in the value of blooded stock and in nearly all kinds of farm produce has been fully recognized in the taking of inventory. The result is that although there is really more stock on the farm and more produce on hand than there was a year ago, and important improvements have been made with the special appropriation to the Farm Department, still the department is charged with $1,976.82 decrease of inventory.

The labor of students is a very important feature of the Agricultural College, both for its moral and educational influence, and also as a means of enabling young men of limited resources to obtain an education. But it is impossible to make it remunerative to the Institution. It is confessedly educational. It requires more supervision than ordinary labor, and so large a number of hands working three hours each day cannot be so profitably managed as a correspondingly smaller number working the whole day. These facts should be taken into consideration in connection with the cost of the industrial departments of the College.

The above remarks in regard to inventory and students' labor, except in relation to blooded stock are as applicable to the Horticultural as to the Farm Department.

COLLEGE LANDS.

An Act of Congress, approved July 2, 1862, donated to each State public lands to the amount of 30,000 acres for each of its Senators and Representatives in Congress, according to the census of 1860, and the "endowment, support, and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts."

The Legislature accepted this grant, and bestowed it upon the Agricultural College. By its provisions the College has received 235,673.37 acres of land. The sale of these lands is under the direction of the Agricultural Land Grant Board, consisting of the Governor, Auditor General, Secretary of State, State Treasurer, Attorney General, and Commissioner of the State Land Office.

Any information in regard to these lands may be obtained by applying to the Commissioner of the State Land Office. The interest at seven per cent. of the fund accruing from the sale of these lands is applied to the support of the Agricultural College.

The following tables, for which we are indebted to the courtesy of the Commissioner of the State Land Office, give a detailed account of the sales of College lands up to September 30, 1878, also the number of acres of these lands yet unsold and the counties in which they are located.

Showing Number of Acres of Original Sales and Forfeited Lands Resold, and Amount Sold for from 1868 to Sept. 30th, 1878, inclusive.

Original Sales, Acres.	Amount Sold for.	YEARS.	Forfeited Acres Resold.	Amount Sold for.
520.00	$2,600 00	1868		
13,480.00	43,000 00	1869		
3,280.00	11,280 00	1870		
9,372.44	31,637 32	1871		
20,580.25	65,660 75	1872		
17,205.89	54,177 67	1873	40.00	$145 00
2,039.95	6,519 75	1874	40.00	120 00
4,798.99	14,796 97	1875	40.00	120 00
1,953.73	6,101 19	1876	520.00	2,280 00
1,634.75	4,904 25	1877	200.00	600 00
4,034.80	12,504 40	1878	1,135.73	4,443 65
78,900.80	$253,182 30		1,975.73	7,708 65

AGRICULTURAL COLLEGE LANDS.

Showing, by Counties, Amount of Lands Sold at Original Sale; also Forfeited Lands Resold from Sept. 30, 1877, to Sept. 30, 1878, being for the Fiscal Year.

COUNTIES.	Original Acres Sold.	Forfeited Acres Sold.	Price.	Amount Sold for.	Amount Paid.	Amount Due.
Alcona	200.00	495.73	$5 00	$3,478 65	$3,478 65	
Alpena	200.00		3 00	600 00	150 00	$450 00
Antrim	594.80		3 00	1,784 40	446 09	1,338 31
Benzie		40.00	3 00	120 00	30 00	90 00
"		40.00	3 50	140 00	35 00	105 00
Charlevoix	80.00		3 00	240 00	60 00	180 00
Cheboygan	320.00	40.00	3 00	1,080 00	510 00	570 00
Grand Traverse	120.00	200.00	3 00	960 00	254 00	706 00
" "		80.00	3 31¼	265 00	66 25	198 75
Kalkaska	560.00	80.00	3 00	1,920 00	480 00	1,440 00
Manistee	480.00	80.00	3 00	1,680 00	420 00	1,260 00
Otsego	920.00		3 00	2,760 00	1,050 00	1,710 00
Wexford	560.00	80.00	3 00	1,920 00	480 00	1,440 00
	4,034.80	1,135.73		16,948 05	7,459 99	9,488 06

TABLE Showing by Counties the total Number of Acres which have never been sold; also Total Acres Forfeited to the State, making total Number of Acres Standing Vacant on September 30, 1878.

COUNTIES.	Original Acres Vacant.	Forfeited Acres Vacant.	Total Acres Vacant.
Alcona	25,910.43	560.00	26,470.43
Alpena	520.00	....	520.00
Antrim	9,672.38	40.00	9,712.38
Benzie	5,920.00	160.00	6,080.00
Charlevoix	3,604.98	....	3,604.98
Cheboygan	4,775.04	....	4,775.04
Grand Traverse	520.00	240.00	760.00
Iosco	26,995.88	120.00	27,115.88
Kalkaska	5,276.74	80.00	5,356.74
Leelanaw	....	40.00	40.00
Manistee	8,120.00	1,120.00	9,240.00
Missaukee	3,837.49	518.40	4,355.89
Montmorency	9,922.95	....	9,922.95
Oscoda	17,065.27	120.00	17,185.27
Otsego	5,470.13	....	5,470.13
Presque Isle	960.00	198.06	1,158.06
Wexford	28,160.00	1,720.00	29,880.00
Total	156,731.29	4,916.46	161,647.75

SALARIES OF THE FACULTY AND OTHER OFFICERS OF THE COLLEGE.

Theopilus C. Abbot, LL. D., President, Professor of Mental Philosophy and Logic, $3,000.

Robert C. Kedzie, A. M., M. D., Professor of Chemistry and Curator of the Laboratory, $2,000.

George T. Fairchild, A. M., Professor of English Literature, and Librarian, $2,000.

Albert J. Cook, M. S., Professor of Zoölogy and Entomology and Curator of the General Museum, $2,000.

William J. Beal, A. M., M. S., Professor of Botany and Horticulture, and Curator of the Botanical Museum, $2,000.

Alfred B. Gulley, Superintendent of the Farm and Garden, $2,000.

Robert G. Baird, Secretary, $1,250.

Rolla C. Carpenter, M. S., C. E., Instructor in Mathematics and Civil Engineering, $1,000.

Charles L. Ingersoll, M. S., Professor of Practical Agriculture, $1,000.

Robert F. Kedzie, M. S., Assistant in Chemistry, $800.

Frank A. Gulley, Foreman of the Garden, $400.

James Cassidy, Gardener, $600.

Emery C. Fox, Steward, $600.

Alfred B. Gulley was employed as Superintendent of the Farm and Garden till Nov. 20, 1877, with salary at the rate of $2,000 per annum.

DEPARTMENT REPORTS.

REPORT OF THE PRESIDENT.

STATE AGRICULTURAL COLLEGE,
LANSING, MICHIGAN, *August 31, 1878.*

I have given instruction to the Seniors during the year ending August 31, 1878, in Psychology, the Constitution of the United States, and in Inductive Logic.

The changes in the working force of the College, indicated in my last report as likely to be made, have been carried out,—Mr. Charles W. Garfield leaving the formanship of the Gardens October 1, 1877, and Professor A. B. Gulley, the Superintendency of the Farm and Gardens November 20th. Mr. L. S. Hudson vacated the Stewardship which he had held for one term, November 30, 1877.

Mr. Ransom H. McDowell, graduate of the class of 1874, was selected by Professor Ingersoll as Assistant Foreman of the Farm, and entered on duty December 1, 1877. Mr. Frank A. Gulley was made Foreman of the Horticultural Department March 1, 1878, and Mr. Emery C. Fox was appointed Steward of the Boarding Hall, January 30.

MORE ROOM FOR STUDENTS.

The Spring term brought an accession of sixty-six new students into the Freshman class. The applicants for admission are likely soon to exceed our accommodations, and the question arises, What shall be done?

We might raise the standard of admission. We now examine in Arithmetic, Geography, Grammar, Reading, Spelling and Penmanship. The examinations are very thorough, as these branches are not taught here, and a knowledge of them is requisite to the studies that are entered upon. In Arithmetic, a knowledge of rules and definitions, and the doing of easy problems throughout the science will not be accepted as sufficient. The applicant must show ability to think. Seventeen applicants for admission were rejected when we took in the last Freshman class.

The objections to raising the standard of admission are—that we are, in the words of the law of the State—to take "the graduate of the common school." Although many of the common schools teach Algebra, Rhetoric, and History, yet they cannot be depended upon to do so. The students who come to us are for the most part dependent on their own earnings for their support, they are the sons of farmers, living at a distance from the graded and higher schools, and have received all the education they have in the home schools. We desire

to retain this class of students, a class who may not have had the opportunity to go further than the minimum laid down by the law of the State, as requisite for admission here.

The larger part of the students who come to the College have had a course of instruction in Algebra, and it is desirable that they should have had it; and sometimes the students are divided into sections on their knowledge or ignorance of algebra, but no student is excluded, or put in any way of exclusion for ignorance of any branch not required on entering.

Were we near the city, students for whom we cannot find rooms might find them there, and be present at the College exercises regularly. We are three and a half miles from the city, and in the spring, and sometime in autumn, and throughout the winter, might as well be thirty—so impassable are the roads. A street railway from the city to the College, which would not cost so much as a new hall, would afford opportunity for indefinite growth to the College. Students could find rooms in the city. If there were a way for the State to help such an enterprise, and she should do so, that matter of *room* for students would hereafter be set at rest.

Otherwise there seems to remain to us but two courses,—to build a new hall at once, or to let students go home, telling them that we have no room for them. We shall have about forty places that can be filled next spring. Should they be taken, we shall have in September, 1879, only such places for the freshman class coming in at that time, as are made vacant by the occasional leaving of students.

DORMITORIES.

There are two dormitories for students.

Williams Hall, named after Joseph R. Williams, the first President of the College, was built in 1869, at a cost of $34,550. It is also the boarding hall of the students, and the steam heating and cooking apparatus, the gas pipes and furniture cost $13,075. There are thirty-eight rooms in this building, accommodating (one room being adapted to but one) seventy-five students.

Wells Hall is named after the Hon. Hezekiah G. Wells of Kalamazoo, president or acting president of the Board of Agriculture from 1861, when the Board was first established, to the present time. This Hall was built in 1877 at a cost for construction, heating apparatus and furnishing, of $25,000. The hall contains sixty-nine students' rooms, accommodating one hundred and twenty-seven students. The whole number of students that can be accommodated with rooms is two hundred and two.

GENERAL ACCOUNT OF THE COLLEGE.

No general account of the College has appeared in our reports for some years. As calls are frequently made for more information than is contained in the catalogue, I propose to give in this place some account of the College and its several departments. My own appointment to a professorship in the faculty was made by the Board of Education, at that time in charge of the College, on February 5th, 1858, only nine months after the opening exercises. I was appointed treasurer of the College at that time. In 1861 the charge of the College was transferred from the State Board of Education to a State Board of Agriculture, created for the purpose by the Legislature. Under the reorganization the work that had devolved on the treasurer was mostly transferred to the secretary, and I was made secretary, and performed the duties of that office until I was made president of the College, December 4th, 1862. I have

thus had the pleasure of the personal acquaintance of all the members of the boards having control of the College, of its officers, and of many of its working friends, from before its organization; and the further pleasure of seeing it win the regard, from year to year, of men who at first doubted the usefulness and final success of the institution.

LOCATION.

The Agricultural College is on a farm of 676 57-100th acres, lying three and a half miles east of the city of Lansing. The Red Cedar River runs through the farm. The soil is very various, embracing heavy clay, clay loam, sandy loam, sand, peat, and alluvial soil. It is subject to early and late frosts, and lies, according the National statistical atlas of the United States, in a region more subject to droughts than the lands east, west, or south of us. The site was selected by the officers of the State Agricultural Society, under the restriction which the friends of the College did not approve, but which was part of the statute of organization, that it should be within ten miles of Lansing, and not cost over $15.00 an acre.

Latitude of College Hall, as determined by Prof. Carpenter (see his report), is 42° 54″ .23, its longitude 84° 29′ 00″.60 west of Greenwich. Its time is 5m. 43-568 sec. behind Detroit time, and 17-504 sec. ahead of Lansing time, and 12m. 30-606 sec. ahead of Chicago time; and the elevation of the water-table of College Hall is 244.52 feet above the level of the Detroit river, and 819.13 feet above the level of the sea.

The land at the time the college was located on it, was almost in a state of nature. It has now become, as Gov. Baldwin was wont to express the desire that it might, one of the most beautiful places in the State. Its buildings and small fruits are scattered over a park of eighty acres. The Farm, Horticultural and Botanical Departments divide up the remaining portion of the land.

THE FIRST COLLEGE.

The Michigan Agricultural College is the pioneer of its sort in the United States, and has served to a great extent, as the model upon which the others were founded.

The Maine Agricultural College professor of Agriculture spent a week with us, and it selected its first instructor of horticulture from among our graduates. All three Presidents of the Massachusetts Agricultural College have visited us,—the first one, Judge French, before the organization of their own. Ezra Cornell, the founder of the New York College, the Hon. A. D. White, its President, visited us at two different times, a Professor of Agriculture elect spent several days with us, and their professor of botany is a graduate of this College. Their present farm manager has recently spent a week here. Officers of the colleges in Maryland, West Virginia, Indiana, Ohio, Arkansas and Minnesota have visited us. Iowa chose for its president a former member of our Board, and a graduate for its professor of Botany and Horticulture. Wisconsin has a graduate for its professor of Chemistry. Missouri's professor of Agriculture is a graduate of ours; so is the professor of Agriculture in Kansas Agricultural College. The president of the Illinois Industrial University was once secretary of the Board having charge of the Michigan Agricultural College. Harvard University, Cornell University, Minnesota University, have all employed graduates of ours as assistants, and one graduate is the professor of Chemistry in Oberlin University, Ohio.

The methods pursued here are therefore widely known, and have, to a con-

siderable extent, served other colleges as patterns for theirs. Especially, the success of the system of manual labor here, has induced other colleges to try it.

The College with its one unusual course of study is of course a small affair in comparison with the University, with its many and well established courses of study, but in its limited sphere, it will be found to have a reputation second to no other of its sort. It engaged the largest share of the attention of the Industrial section of the National Educational Society in the centennial year, at Baltimore, and a delegate from California came to the College to see personally the working of the labor system. It would be easy to multiply quotations from persons standing high in the educational and agricultural world, as to the excellent reputation the College has won. Dr. Angell, when he first came from the east to take charge of the University, publicly stated that it was looked upon in the east as the most successful of its kind.

Mr. Gilmore, who from being professor at Yale, became President of California University, and is now President of John Hopkins University, Baltimore, visited some years ago the industrial schools of the country as U. S. Special Commissioner. In his report he speaks of this College, alone of all, as having a well assured success.

James McDonal, who was sent out by the Edinburgh Scotsman to report on the cattle raising of the United States, wrote a prize essay on the Agricultural Colleges of this country. He selects ours as the one to describe at length, as being one of the oldest and best.

Since we in the State live so near the Institution as to see whatever imperfections it has, it seems to me not unbecoming to suggest that it has also a relative standing; and to show that in its success, the reputation of the people of Michigan for her educational institutions is not endangered, but is enlarged. We should all be glad to see the College so supplied with competent instructors in all branches of agricultural science in the largest extent of the term, with libraries, museums, collections of plants, animals, and the like, as to make it the fitting resort of those who seek information on anything relating to agriculture and kindred branches.

ENDOWMENT AND SUPPORT.

1. The Michigan Agricultural College owes its establishment to a provision of the Constitution of the State, adopted in 1850. The Constitution says, in Article 13: "The Legislature shall, * * as soon as practicable, provide for the establishment of an Agricultural School."

The College was opened to students in May, 1857, with appropriate exercises, being thus the first of the existing Agricultural Colleges of the country.

An act of Congress, approved July 2, 1862, donated to each State public lands to the amount of 30,000 acres for each of its Senators and Representatives in Congress, according to the census of 1860, for the "endowment, support, and maintenance of at least one College, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts."

The Legislature accepted this grant and bestowed it upon the Agricultural College. By its provisions the College has received 235,673.37 acres of land. These lands have been placed in market, and 78,900.80 acres have been sold, giving a fund of $253,182.30, the interest of which at seven per cent is applied to the support of the College. The sale is under the direction of the Agricul-

tural Land Grant Board, consisting of the Governor, Auditor General, Secretary of State, State Treasurer, Attorney General, and Commissioner of the State Land office. Any information in regard to these lands may be obtained by applying to the Commissioner of the State Land Office.

The income from the College lands will increase as the sales of these lands increase. The State is forbidden by United States enactment from suffering this fund to be diminished, from making any charge for its management, and from using it, or the interest of it, for the erection or repair of buildings.

2. The income derived from students is small. Tuition is free, and board is furnished at cost; any balance at the close of one term's board account is carried to the next term's account. The fees for matriculation and diplomas go to the increase of the library, while the fees for room rent and incidentals are designed to cover the expense of small repairs, care of the halls, printing of work bills, blanks, and the like.

3. The Legislature has made from the first, appropriations of money, both for current expenses, and for buildings. These have been made with the liberality for which the State is noted in its dealings with its educational institutions. The sum appropriated for 1878 was $11,836.80. The same was appropriated for 1877, with an additional $25,000 for a new hall.

THE GOVERNING DEPARTMENT.

Board of Agriculture.

The Board of Agriculture to whose care the College is committed, is composed of two members *ex-officio*—the Governor of the State and the President of the College, and of six members appointed by the Governor and confirmed by the Senate. One-half of the appointed members must be practical agriculturists. Their term of service is six years, two going out of office every second year. They receive no compensation for their services.

It may not be improper in me to speak of the members of this Board. At its head is the Hon. H. G. Wells, of Kalamazoo, whose late services as presiding judge of the Court of Commissioners of the Alabama Claims have had the rare fortune to be universally approved and appreciated. Judge Wells has been on our Board since its organization in 1861, and has sometimes given several weeks successively to the interests of the College. He represents the College on public occasions, and in its relations to the government and other institutions: authorizes the receiving of its funds from the State; draws up all deeds, contracts and other important papers, and negotiates the sale of the larger tracts of swamp lands. Mr. Wells was once President of the State Agricultural Society; is familiar with fruits and their cultivation and has a wide and varied knowledge of horticulture and floriculture, and of trees. He is a member of the Horticultural Committee of the Board. He was, in 1877, reäppointed by Gov. Croswell for six years more of service.

Mr. J. Webster Childs, of Ypsilanti, is now in the 9th year of his service on the Board. He is too well known as a farmer and orchardist and for his long continued services in the Senate and House of Representatives to need any mention here. His influence was given—rather his unremitting work in behalf of the College was given to it long before he became a member of its Board. After being for some years at the head of the Committee on Farm Management, he is now the chairman of the Committee on Buildings and College property.

Mr. Geo. W. Phillips, of Romeo, came upon the Board by appointment of Gov. Baldwin, in 1871, and has been reäppointed by Gov. Croswell. He is well known as a prosperous farmer, as having been for many years—ten at least, I do not know how many more—a member of the Executive Committee of the State Agricultural Society and usually acts as superintendent of the stock at the fair. He is a breeder of Short-horns, and has an acquaintance, not only with the management, but with the families and pedigrees of stock that make his services of great value to us. His connection with the State Agricultural Society, as does that of Mr. Childs, also serves as a bond of friendship between us and that Society additional to the community of our interests. There exists, I believe, the most cordial good will between the College and the Society. Mr. Phillips is Chairman of the Committee on Farm Management.

Mr. Franklin Wells of Constantine is the next name on our general catalogue. He was appointed by Gov. Bagley in 1873. As chairman of the College Committee on Finance he seems to me to be as nearly perfect as a man can be. His acquaintance with business affairs is extensive and accurate to a remarkable degree. He keeps in mind the state of the accounts of each department of the College, solves the perplexities that arise in the complicated business of a school that is also a farm, and audits every account that is paid by the institution. I do not believe his private business receives a more careful scrutiny than do the affairs of the College.

I know better than any one else what this means. For ten years previous to Mr. Wells' advent on the Board each officer brought his accounts in person to me to have them audited. We ran through them item by item, and I spent a full half of the long winter vacation in classifying these items and drawing up one full statement of the College receipts and expenditures. A new system of accounts and of auditing throws this burden,—a great one,—upon the Secretary of the Board and the chairman of the Finance Committee. Mr. Wells has a quick appreciation of the beauty of good stock and good farming, and takes a keen interest in every department of the College.

Mr. A. Smith Dyckman was appointed to a place on the Board in 1873. He was President of the State Pomological Society, and is well known as one of the largest and most successful fruit-growers of the west. He is known also as a public spirited man, awake to the interests of whatever advances a community in education. He is the chairman of the committee on the Horticultural Department of the College.

Mr. Milton J. Gard was appointed in 1875 by Governor Bagley. The Governor was looking for a farmer of acknowledged success, whose intelligence was keeping pace with his success, and found him in Mr. Gard, a gentleman well known in his own part of the State. Mr. Gard is on the Committee on Farm Management, and heads the Committee on Employés.

Under the charge of these six men, in sympathy with all the work of the farmer, zealous for his enlightenment and prosperity and dividing the committee work among themselves, is the farmers' College of the State. How could one better it?

THE FACULTY.

The charge of the education, and of the labor of students, is committed to a Faculty consisting of a president, six professors, and a secretary, assisted by, at present, one assistant in chemistry, two farm foremen, and a gardener, a garden foreman, and a carpenter. The salary paid the president is $3,000,

and house rent. The professors receive $2,000, and house rent, and the others various lesser sums. Various considerations weighed with the Board in making no reduction of salaries consequent on a reduced income for the years 1877 and 1878.

The cares and duties of the professors have been greatly enlarged with the growth of the institution, without a corresponding increase in the number of officers.

The officers are far more heavily pressed with work than is usual, or is usually thought warrantable in those colleges in which a high class of scientific instruction is given. They have also, at the beginning of the only vacation that exceeds a week in length, to prepare for, and in January, to hold a series of Farmers' Institutes, which, although a pleasant, is a laborious work, that almost exhausts the time they would like, and should have for the preparation of lectures for the coming college year.

I am sure no farmer or mechanic does, because no one can, devote more time or severer effort, to his work than the officers of the college; nor is their work anything so exhausting to the health and nervous system as ours. The officers surely earn, and are worth to the State all that is paid to them. The Board have by severe economy, by a vacancy for some time unsupplied, by the abandonment of one office, and through other favoring circumstances, maintained the salaries at their old rate, as they thought justly due to men who were giving all their time, and efforts, for the good of the State. That these efforts are not fruitless is now universally admitted by the farmers of the State who have kept themselves informed as to the influence the College has exerted.

COURSE OF STUDY.

The course of study is four years in length. Students who take the full course are graduated with the degree of Bachelor of Science. The College and its classes are, however, always open to students who come to take select studies, and we have had many who after taking Chemistry and Botany and a few other select branches have not cared, or not been able to complete the course.

The following is the course of study:

FRESHMAN CLASS.

Autumn Term.—Algebra, Olney's University; History, Swinton's Outlines; Elements of Rhetoric, D. J. Hill.

Spring Term.—Algebra Completed, Olney's University; Book-keeping (three weeks), Mayhew's Practical; Botany, Gray's Structural; Agriculture, Lectures.

Summer Term.—Geometry, Olney; Botany, Gray's Structural, Wood's Manual; French, Otto's Grammar, Bôcher; Elementary Chemistry (two weeks), Lectures.

SOPHOMORE CLASS.

Autumn Term.—Geometry completed, Olney's; Elementary Chemistry, Lecsures, Roscoe; French, Bôcher's Otto's Reader.

Spring Term.—Trigonometry, Olney; Surveying, Lectures; Organic Chemistry, Lectures; Blowpipe and Volumetric Analysis; French, Bôcher's Otto's Reader.

Summer Term.—Mechanics, Peck; Analytical Chemistry, Kedzie's Hand Book.

JUNIORS.

Autumn Term.—Mechanics completed, Peck; Anatomy, Lectures; Agricultural Chemistry, Lectures; Horticulture, Lectures.

Spring Term.—Principles of Human Physiology, J. C. Dalton; Chemical Physics, Miller; Principles of Rhetoric, A. S. Hill.

Summer Term.—Entomology, Lectures, Packard, Cook's Apiary; Meteorology, Lectures; English Literature, Lectures, Chambers' Encyclopedia.

SENIORS.

Autumn Term.—Zoölogy, Lectures; Geology, Dana's Text Book; Agriculture, Lectures; Psychology, Bascom.

Spring Term.—Drawing, Minifie's Geometrical; Astronomy, White; Botany, Laboratory work; Constitution of the United States, Andrews; Moral Philosophy, Fairchild.

Summer Term.—Civil Engineering, Lectures, Trautwine; Political Economy, Lectures; Landscape Gardening, Lectures; Inductive Logic, Fowler.

TEXT BOOKS.—As text books are liable to be changed, students are advised not to purchase books in advance without consulting officers of the College.

Slight variations from this course of study will be necessary for the next year, as shown in the catalogue.

THE CHEMICAL DEPARTMENT.

The Chemical Department received a better recognition from the authorities of the College from the start than any other. Modern agricultural chemistry was not twenty years old when the College was founded. In 1840 neither Liebig, Boussingault, nor James F. W. Johnston had written on the application of chemistry to agriculture. Before the opening of the College to students, in May, 1857, the room now used for the library was fitted up as a chemical laboratory and put in charge of Professor L. R. Fisk, now president of Albion College. Having been reared on a farm, and being familiar with its operations, he saw at once the rich field of investigation that lay before the agricultural chemist in the double work of investigating the laws of husbandry and in qualifying others by his instructions for such investigations. He could do little among the stumps, however, in out of door work, but he at once prepared and gave a course of lectures on Agricultural Chemistry.

When Dr. Fisk left at the close of six years' service, the College was fortunate enough to fill the place (Jan. 28, 1863), with R. C. Kedzie, M. D., the present professor of Chemistry.

In 1871 a Chemical Laboratory was constructed, according to a plan made by Dr. Kedzie, after a careful examination of eastern laboratories. Its cost was $11,507.13. It was the first, I believe, of American colleges to put in the Bonn Self-Ventilating Evaporating Hoods, which were *in* the Bonn building, but had not yet been tried. It was the first also to have the working tables end against the windows instead of between them. The laboratory is supplied with water, and (1877) with gas. A description of the building and its several rooms is given in the report for 1871, pages 9 to 20. It remains to be said that this building, which was thought to be ample for all needs of the College for many years, is now outgrown. Neither the lecture room, nor the working room will longer accommodate, with any crowding, the students in chemistry and its applications. The Legislature will probably be asked for an appropriation for its enlargement.

The regular instruction in Chemistry embraces a course of daily lectures for a term, and two weeks in Elementary Chemistry; a term's daily instruction in Organic Chemistry, and in Blow-pipe and Volumetric Analysis; a term in Laboratory practice in Analytical Chemistry, three hours each day; a term's lectures in Analytical Chemistry; a term's recitation in Chemical Physics; and a term's lectures in Meteorology. The illustrative experiments are numerous. Each student is required to make an analysis of at least one hundred substances, embracing commercial and natural productions, manures, ashes of plants, technical minerals, and soils.

Omitting the synopsis of the other lectures, which is given in the catalogue, I will here transcribe the synopsis of the course in Agricultural Chemistry:

AGRICULTURAL CHEMISTRY.

Formation and composition of soils; the relations of air and moisture to vegetable growth; connection of heat, light, and electricity with growth of plants; nature and source of food of plants; chemical changes attending vegetable growth; chemistry of the various processes of the farm, as plowing, fallowing, draining, etc.; preparation, preserving, and composting of manure; artificial manure; methods of improving soils by chemical means, by mineral manures, by vegetable manures, by animal manures, by indirect methods; rotation of crops; chemical composition of the various crops; chemistry of the dairy. The instruction in agricultural chemistry is imparted by lectures.

Dr. Kedzie has always been active in all investigations that promised to be useful to farmers, both as chemist in the College, or as a member of medical associations, or of the State Board of Health, of which he has been an active member from the first, and of which he is now president.

In April, 1863, he commenced taking meteorological observations, three times a day, of the state of the thermometer and barometer, and of the clouds, winds, relative humidity, pressure of vapor and rain fall, and these have been continued and published annually to this time,—fifteen years. Ozone observations were added in January, 1871; and it is reported that when Mr. Law, the professor of veterinary in Cornell University, desired records of ozone, our own were found to be the most complete and long continued in the country. These observations are not only printed in our reports, but have been regularly forwarded to the Smithsonian Institution in Washington, and they have served materially to the understanding of the climate of Central Michigan.

In 1863, Dr. Kedzie investigated the properties of swamp muck, made experiments, and lectured on the subject. He returned to the subject in 1876, Report, p. 224. Experiments in top dressing were made by him in 1864, 1866, and 1868. In 1866, Dr. Kedzie made to the Legislature a Report on the destruction of Forest Trees, and the report was quoted with marked approval throughout the land. Then followed investigation of poisonous arsenical wall papers commonly sold in the shops, to the great destruction of health. The full discussion of the subject appears in the report of the State Board of Health, but a sketch of the importance of the investigation is given in the 1874 report, p. 92. Then followed investigations in ventilation of houses and in the dangers arising from poor kerosene. A plain talk to the farmers about lightning rods, for the purpose of putting them on guard against paying enormous prices for rods worth no more than common bars of iron, led to discussions which resulted in ingeniously contrived and convincing experiments on the passage of frictional electricity through rods. The article of Dr. Kedzie's was reprinted entire in scientific journals in New York and England.

When the potato beetle made its appearance farmers were frightened away from the use of Paris green by warning communications to the New York Evening Post and other papers. Dr. Kedzie at once grew crops dressed with Paris green; and analyzing soils and fruits found that the fruits (grain) did not imbibe the Paris green, and that the poisonous element was rendered insoluble by chemical action of common soil. The investigations were reprinted in English papers and translated for French and German periodicals.

When the cabbage worms appeared and people began to use Paris green for them as they had done for potato beetles, Dr. Kedzie at once gave warning through the press of the danger.

When the State Convention of Millers set down Clawson wheat as of an inferior grade, Dr. Kedzie, by experiments and analysis contributed much to the settlement of the question of its true relative value. These are some of the ways, gathered from memory without searching them out, in which the chemical department is of service to the State, aside from its main use, that of the instruction of students. They are set forth, not to praise Dr. Kedzie, who does not need praise, but to show that the College interests itself in what is of present interest to farmers. Dr. Kedzie, and Robert F. Kedzie, his assistant, are helping the farm department by analyses of milk, and by other ways, in the farm experiments. It is hoped the useful activity of the department will be remembered when it asks an enlargement of its laboratory.

BOTANY AND HORTICULTURE.

Botany and Horticulture have been from the first recognized as entitled to a place in the instructions of the College. Professor John C. Holmes, of Detroit, to whose efforts the establishment and early success of the College was so largely due, was horticulturist from the opening of the College in May, 1857, to 1862, excepting the year 1859, when there was neither botanist nor horticulturist. Prof. A. N. Prentiss, now of Cornell University, but then a sophomore in the Agricultural College, took charge of the gardens during that year. Dr. George Thurber, now editor of the American Agriculturist of New York, was made Professor of Botany in 1860, and was both botanist and horticulturist in 1863. Professor Prentiss had charge of the department from 1863 to 1869. Will. W. Tracy, a graduate, taught horticulture and landscape gardening from 1870 to 1872 while Professors Prentiss and Beal gave the instruction in botany. Prof. Beal lectured in 1870, and was appointed Professor of Botany in 1871. He still holds the position, and has for the most part been also the Superintendent of the Horticultural Department. During Profesor Prentiss' administration a complete separation of the horticultural from the agricultural department was made. Each department from this time down has been possessed of its own barns, teams, implements, and working force.

BOTANY.

The professor keeps virtually in mind the words of Lord Bacon when he says: "This therefore is the first distemper of learning, when men study words and not matter." To get the definitions of the parts of plants, and by analysis and a comparison of the parts with an artificial key to determine the name of a plant, and then to prepare a nicely pressed specimen of the flower and leaves, —this has been thought to be all there is of the study of Botany.

With us the student is introduced at once to the plants and made to study them in their forms. He commits no lessons from a book for several weeks until he has learned to trust his own habits of observation. A world of truths lie

about us which we do not see, because we have never been taught to observe them. It is of prime importance that the botanist should be taught to note in his mind the likenesses and differences in every day plants about him. Instruction is then given in the functions of the various parts of different plants, the anatomy of stem, roots, leaves and other organs.

The student is taught the classification of plants, and to a limited extent becomes familiar with the different orders, and the kind of plants found in them, their uses in manufactures, for food, or ornament, and their geographical distribution.

Of course very special attention is given to the grains and grasses, and other plants grown in Michigan. Trees and shrubs are plants to a botanist, and those that grow, or that are cultivated in our State are studied.

Botany makes a near approach to agriculture when it discusses the principles of the germination, growth, fecundation, fruiting, and seed-making processes of plants. The study of any crop sends the student back to the botanist, and then to the chemist for the means of understanding it. Chemistry and botany are sciences underlying husbandry, and the professors of these sciences, when they teach with distinct reference to agriculture, are the professors of scientific, as distinguished from practical agriculture.

The instruction in botany is given, like that in practical agriculture, partly in the Freshman, and partly in the Senior year. In the Senior year the course of study consists of laboratory work with the compound microscope.

HORTICULTURE.

Lectures in horticulture succeed the Freshman course in botany, and is given to the Juniors, inasmuch as during their year the class have systematic work in the Horticultural Department. One afternoon a week a section of this class spends in company with the professor in the orchard, vineyard, gardens, or the park in work which, being wholly for educational purposes, is given without compensation.

The Horticultural Department has allotted to it one-third of so much of the working force of students as is given to farm and gardens—the farm taking two-thirds.

The means of illustration in the Departments of Botany and Horticulture are:—

The botanical gardens about the greenhouse and in other places, where a great variety of plants are grown, and where, as the grounds admit of it, and the purposes of science are not disturbed by it, they are tastefully arranged by the gardener of the College. A large variety of the grasses are grown in rows for study. West of the greenhouse the bank of a ravine has been converted by means of a rockery into a receptacle for plants requiring different degrees of moisture, until at the bottom we have marsh, and water plants.

The greenhouse with its several rooms differing in heat and moisture furnishes the student an opportunity of studying plants that will not grow in our climate, but which illustrate principles of botany and vegetable physiology, or help to a knowledge of different orders, or are themselves of interest for their uses. The number of plants is about 9,000 and of 1,180 species and varieties.

An arboretum north of the professors' houses contains nearly all the kinds of trees that grow in the State, and many which do not, in rows, while in the College Park the trees are labelled, to enable the student to distinguish them. The professor of botany has been preparing a key or guide to the trees.

There is an apple orchard of over 400 trees, embracing about 300 varieties

of apples, a cherry orchard of 100 trees and 10 varieties, a pear orchard of 165 trees of 32 varieties, two vineyards of 800 vines and 77 varieties, besides over 300 seedlings, gardens of small fruits, and a vegetable garden. The vegetable garden is to be removed to fields No. 1 and 2, just west of the apple orchard, where it will find ample room and better soil.

The Horticultural Department possesses an Herbarium of dried plants, being the valuable collection of Dennis Cooley, M. D. This herbarium was the life work, aside from his professional labors, of Dr. Cooley; and has few equals in value in the West. It was the noble gift of his widow, now Mrs. Clarissa Babbitt, of Washington, Macomb Co. A sketch of the life of Dr. Cooley is to be found in the Report of the Board of Agriculture for 1863. The College has also a Museum of Vegetable Products, including sections of woods, samples of gums, grasses, seeds and grains, charts, and microscopic slides. There are ten compound microscopes for the use of students in botany.

The Botanical portion of Library, although far from extensive, contains most of the American works and reprints on horticultural subjects. It has a full set, bound, of the Gardener's Chronicle, weekly, from its first number, January, 1841 to the present time; a complete set, bound, of The Garden, an illustrated weekly, from its first number in November, 1871. These are English papers and are taken by the College and bound annually. The Library also contains the Hovey's Horticulturist complete from its first number in 1835, to its close in 1868. It possesses many volumes of other magazines of horticulture, and many reports of societies.

The students are kept informed of the various experiments in botany and horticulture made by the Professor. This volume will contain a lecture of Prof. Beal's, giving some account of the experiments conducted by him at the College. The experimenting, it is hoped, will make the graduates capable of assisting in observations and experiments hereafter.

The wants of the department are numerous. It needs a working laboratory, a building distinct from others, as the chemical laboratory is. It has now no class rooms of sufficient size to hold the classes, nor sufficiently light for microscopic work. It has no room for the arrangement of its museum. The larger part of the use of the specimens is lost if they have to be dug out of the bottom of a box to be seen, and are accessible to students only in class room.

Landscape Gardening receives a short course of lectures,—one-half term. Prof. Beal takes charge of the class, giving instruction by lectures, the reading of Kemp, Downing, Weidenmann, and other authors, and by practical illustration and work in the Park.

AGRICULTURAL DEPARTMENT.

The agricultural department of the College receives the largest share of attention. As I look upon it we have three professors of agriculture: The professor of Chemistry, who gives courses of lectures on Agricultural Chemistry, the professor of Botany and Horticulture who teaches vegetable physiology and the laws of growth, and the professor of Practical Agriculture who teaches approved methodt of managing farms; but as these departments are usually distinguished, I will give a brief account of the Farm Department proper.

A distinct professorship of Agriculture does not seem to have been thought of in the first years of the College. The President of the College, Mr. Joseph R. Williams, and a farmer as foreman, took charge of all the operations on the

farm. Students were sometimes, when together, given some information regarding farm operations, but received no regular instruction in agriculture.

Dr. Manly Miles, M. D., professor of Physiology, gave in 1862 and 1863 some instruction in Veterinary Medicine and Stock Breeding, but there was no regular instruction in Agriculture except that given by the professors of Chemistry and Botany until 1865, Dr. Miles having been appointed the first professor of Practical Agriculture in the autumn of 1864, the second year of my presidency of the College.

Dr. Miles at once systematized the instruction in Agriculture, at first using the best text books that could be had in this new field of college instruction, and gradually bringing to perfection those courses of lectures which proved so useful and inspiring to successive classes in the College.

Chiefly at my suggestion, the labor of students was brought mainly into the compass of one session of three hours in the afternoon of each day, thus bringing it into more complete control of the officers, and making it more educational to the students. On Professor Prentiss's proposition, the labor of an entire class (now Sophomore) was to be given to the farm, and that of another (now Junior) to the Horticultural Departmen, thus giving the departments an opportunity to give systematic instruction in different kinds of work.

Dr. Miles mapped out the farm anew, into fields of about twenty-five acres each, and established the present rotation of crops, and inaugurated and began a plan of drainage of the farm. He found the stock of the college, excepting some Essex swine, of the most inferior quality, and began to improve it by gradual sales of cattle and the purchase of fewer animals of pure blood. By an arrangement with myself, which the Board permitted to go on undisturbed for some years, the receipts on account of stock went to the improvement of the stock. By this means the College stock became respectable in quality long before any money appropriated to the College by the Legislature was expended directly for stock. The College owes much to the very great ability and the enthusiastic industry of Dr. Miles.

Dr. Miles was succeeded in 1875 by Professor Alfred B. Gulley, during whose two years' service very general improvement was made in the fields and grounds of the College. At the close of Mr. Gulley's first year the superintendency of all the work on the farm and in gardens was given him, and Mr. C. L. Ingersoll made Professor of Agriculture. The additional expense, on our failure to realize the sum of money estimated as necessary to our current expenses, caused the abandonment of the plan.

Professor Charles L. Ingersoll, a graduate of the College, was appointed to his present place in January, 1877, having previously served as foreman of the farm. The area of ground under cultivation has been increased by Professor Ingersoll, and a steam engine set up as a motive power for the barns.

For the management of the farm and of students' work Prof. Ingersoll has two foremen of the farm—both practical farmers, competent of themselves to manage farms, and one of them a graduate of the College. The general management and the control of experiments is with the Professor.

Students work three hours, from 1 to 4 P. M. every day except Saturdays and Sundays, the Sophomores and enough others to make two-thirds the working force being assigned each term to the farm. The teamsters prepare work for the afternoon. The foreman, and some of the Seniors who understand the work, and frequently the Professor, act as directors and leaders in the various kinds of work. To see what students have done, one should look at the pho-

tographs of the College taken after it was opened to students in 1857, and which Mrs. Williams, the wife of the first President, kindly presented to me. Stumps were standing close up to the doors of the three buildings, the only ones then erected, and a rail fence a few rods from the buildings separated the logs and stumps inside from the forest and tamarack swamp outside. One should see, too, the drain-map of the farm, constructed by Professor Carpenter, and showing more than ten miles of tile drainage, done almost wholly by students.

The farm is neither a rich one, nor a poor one. There are in the State many districts better adapted to wheat than ours, as there are sections not so subject to drouth and frost. The farm has a great variety of soil. As you enter the grounds from the west you ascend a hill, having the Red Cedar river beneath a steep and curved bank on your right. This hill is stiff clay, and has been taken for pear and cherry trees. Where the river bears to the right from the drive we have alluvial soil, and about the buildings light sandy loam or sand,—the College buildings standing in an old grove of oaks with now and then a tulip tree. We have clay loam, and light peaty loam, and peat. The farm was selected in view of this variety of soil. The park of some eighty acres, the orchard, and field No. 1 of five acres, are in charge of the Horticultural Department. The rest of the land is in charge of the Farm Department. Six fields of about twenty-five acres each are in the College rotation of crops, called the College rotation, as being peculiarly adapted to this farm, and to a farm worked by students. It is not planned with special reference to wheat. Corn is followed by roots, then oats, then wheat, then clover, then clover again. A yearly report of the management of the farm is published in the reports of the Secretary of the Board of Agriculture. As the farm was not designed to waste money, so neither was it designed to earn money for the State. The first use of it is to afford labor to students, to teach them how to work, and to keep them in the practice, and love of hard daily, systematic manual labor. So far as time and means are given, it serves as an experimental station. It serves as a means of illustration of the kinds and of the growth of crops, methods of cultivation, and experimenting.

The stock on the farm was designed to furnish good specimens of the various prominent breeds, so that students should become familiar with them, their peculiarities, habits, and value. Students often receive lectures in the barns and yards. The keeping of bulls of different breeds is costly, and there has at times been talk of dispensing with males of all but one or two breeds, and keeping specimens of females only, for study. It would, I believe, suit Professor Ingersoll better to keep both male and female of each prominent breed, but not to keep a herd of any but perhaps Shorthorns and Ayrshires.

The College in 1863 purchased a bull and two heifers of Shorthorns and of Devons, and Mr. J. B. Crippen of Coldwater gave a Shorthorn heifer. In 1864 a bull and heifer of the Ayrshire breed were purchased. Galloways and Jerseys were subsequently added to the stock. Males and females of these breeds, and a female Hereford are now at the College. We have Southdown, Cotswold, Spanish Merino, and Black-faced Highland sheep, and Essex, Suffolk, Berkshire and Poland-China swine. The College has from time to time been the recipient of valuable presents of stock. The Devon bull Batavia was given to the College by R. G. Hart, of Lapeer, the Jersey bull Saginaw by Dr. J. S. Curtis of Bridgeport, Saginaw county.

The donation of sheep, swine, and implements to the farm department have been numerous and valuable.

It has been impossible with our limited means to create herds of cattle having animals equal in value to those of special breeders of the different kinds. It is not infrequently said at Institutes and gatherings of farmers that the College should possess the best specimens to be found in the State of each breed, and it is generally added, "if they cannot afford it, let us, the people of the State, place them where they can do it." If this were the only want of the College it might easily be met; but the wants of the College are various and large. The College stock is respectable in quality. The College made no exhibition of stock in the State Fair of 1878, but it made 22 entries and sent 24 animals in 1877. The animals were entered, as they must be by our rules, for exhibition only, but the opinion of their value was expressed by the judges by their decorating five Shorthorns with blue ribbons, and two with red, two Devons with blue ribbons, one with red, two Ayrshires with red ribbons, two Jerseys with blue ribbons, and two Galloways with blue ribbons. This classes eleven animals as equals at least of those that took the first prizes, and five as the equals of those taking the second prizes.

I have dwelt at some length on the farm and stock, on account of the general curiosity as to them. Every catalogue contains a small map of the farm, with numbered fields, and every annual report gives an account of each field and each crop.

INSTRUCTION IN AGRICULTURE.

In addition to manual labor on the farm, under good foremen and the lectures of Dr. Kedzie in Agricultural Chemistry, and those of Prof. Beal in Vegetable Physiology and Horticulture, the Professor of Agriculture, Mr. Ingersoll, gives two full courses of lectures in Practical Agriculture. In these lectures agriculture is treated of as an art founded on experience. The rules that have been found to work best are taught, whether we see through them or not. It is not easy, nor perhaps desirable, to make a very definite line of demarcation between the methods of instruction of the Professor of Agriculture and those of the Agricultural Chemist. The one will speak of scientific explanation, and the other of empirical rules; and, indeed, the two professors confer with each other and help each other in their experiments. But in the main, except in experiments, the fields of instruction of the two are sufficiently separate.

The first course of lectures on Agriculture is given in the Freshman year, the other in the Senior, giving, as in case of Botany, almost all the experience of the College course of the student between them. Before this last course, students will have had a year's continuous work on the farm; will have been through the study of Botany, become familiar with grasses, grains, vegetables, trees; and will have had Agricultural Chemistry, the study of Anatomy and Physiology, and other branches. The study of agriculture thus almost begins and almost closes our course of study.

The following is a brief

SYNOPSIS OF LECTURES IN PRACTICAL AGRICULTURE.

Freshman Course.

History of Agriculture, not only showing the changes that have taken place in the same country in different periods of time; but comparing those that have taken place in different countries, at the same period.

The present of Agriculture; giving a short sketch of the methods practiced in many countries and the comparative results.

History of breeds of cattle: the characteristics of each: points of different breeds; judging cattle by points.

Principles of Drainage: comparison of tile drains with various kinds of covered drains: with open drains: laying out and putting down tile drains and sewers; drainage and sewerage of buildings.

Senior Course.

Principles of stock breeding; how applied in different breeds: results reached: principles of farm economy considered with special regard to mixed husbandry and rotations of crops; planning and construction of farm buildings with reference to some rotation of crops or special system of husbandry; also with reference to the kind and the number of live stock to be kept upon the farm.

Each student is required to select an ideal farm, give size, soil, and other description of interest or importance: assume to have a certain amount in plow land: plan a rotation of crops; decide on the greatest amount of stock to be kept: then draft a plan for barns, stables, etc.; for the proper care of the crops and the shelter of the stock, the care of implements, etc.

AGRICULTURAL LIBRARY AND MUSEUM.

The Farm Department has the beginning of a museum, and some few illustrative pictures and charts. It is in need of a much better collection,—of more barns, implements, and stock.

The Agricultural Library is mostly in the general library. The exceptions are the series of herd books which are kept in the farm office, but which are inventoried with the library. We have the Am. Short-horn Herd Book, Ayrshire Herd Book and Record, Am. Devon Herd Book, Am. Jersey Cattle Club Register, Hereford Herd Book (English), and Coates English Short-horn Herd Book, and one volume of the Poled Galloway Herd Book, and first volume of the Guernsey Register.

The Library contains most of the recent American and English publications on Agriculture, and on stock breeding. There comes regularly to the Reading Room eighteen agricultural journals published on this side the Atlantic, and two weekly agricultural journals from London. We have a complete set of the Journal of the Royal Agricultural Society of England to the present time (39 vols.), and receive the volumes regularly as they are issued. We have the Highland Agricultural Society publications complete in 58 volumes to the present year; the Bussey Institute Bulletins, and nearly complete sets of the Agricultural Reports of the United States, of Maine, Massachusetts, Connecticut, New York, Ohio, Iowa, and less complete sets of the reports of various other States and Agricultural Societies.

ZOÖLOGY AND ENTOMOLOGY AND GEOLOGY.

I come next to the department of Zoölogy and Entomology.

All who have planned out courses of instruction for an agricultural school, have enlarged on the necessity of instruction in physiology and entomology. Instruction in stock-breeding and the races of domestic animals is not, in our scheme, placed in the zoölogical, but in the agricultural department.

During the year 1859, Dr. Henry Goodby occupied the chair of Animal Physiology,—from 1861 to 1865 Dr. Manly Miles was professor of Physiology

and Zoölogy, and continued to fill that of Physiology until 1869. At that time, 1869, Albert J. Cook, the present incumbent, a graduate of the College, was appointed professor of Zoölogy and Entomology.

A collection of the shells of Michigan, and of its animals and minerals, was commenced by Dr. Miles, who had been the Zoölogist of the geological survey of the State. It has been more than doubled under the enthusiastic work of Prof. Cook, and of the many students whom he has inspired with his own zeal.

The College has on deposit numerous specimens sent us by the Smithsonian Institution at Washington. It is entitled by law to sets of specimens of the geological survey of the State, and many specimens have been received from this source. A small annual appropriation gives a constant but too slow growth to the General Museum. Its means of illustration in Geology and Comparative Anatomy are meager. The collection of Michigan birds and animals mounted approximates completeness. The entomological collections are fuller, there being about thirty cases of insects. A large part of the preserving and mounting of animals has been done at the College by students, under the direction of Dr. Miles or Prof. Cook, or by those who had made some special study of the art. The value of the General Museum, a museum excluding the collections in Botany, Chemistry, Agriculture, and other special departments was, Sept. 1877, $5,192.26. Five hundred dollars have been spent upon it since that time.

The Natural History Society of the College has a museum of its own, containing many excellent specimens.

The instruction given in Physiology extends through one term daily lessons. Special attention is given to the comparative anatomy and physiology of domestic animals. The students are taught to dissect animals and to study the tissues under the microscope.

Entomology takes a term of study with daily lessons, and Zoölogy and Anatomy together occupy a third term. In Entomology particular study is made of insects injurious to vegetation. The students dissect and learn to make accurate drawings of the peculiarities which are important in determining families and genera.

Professor Cook has been able to secure through the graduates a corps of good observers of insects and their works in various parts of the State. He is almost flooded with insects and inquiries that pour in upon him regarding them through the mails. The insects often come in the larva state, and have to be fed and developed into the winged state before they can be described. He has given many addresses, and written largely for the press regarding injurious insects. In 1874 he printed a thick pamphlet on injurious insects,—the same forming a part of the report of the Board of Agriculture for that year,—which was widely circulated amongst farmers, as they expressed a desire for it. In 1875 the army worm, in 1876 the bot-fly, the pork-worm, in 1877 the Hessian fly and the insects that attack our timber and shade trees, received his attention, and his winter institute lectures on them will be found in the reports of the Board. In other words, this department, like all the other departments of the College, attempts while teaching science purely to teach its principles at the same time with distinct reference to agriculture, as befits an agricultural college.

APIARY.

A special subdivision of the department is the Apiary. The College has a separate building for the apiary, with grounds on which grow specimens of

honey-producing plants. Twenty-nine colonies were wintered last winter. All the students are instructed to some extent in bee-keeping, using the manual prepared by Professor Cook. Some of the students make a special study of bee-keeping, and a few of its graduates are professional apiarists. Prof. Cook was secretary and afterwards president of the State Bee-Keepers Association. The property of the apiary is valued, exclusive of its garden and grounds, at $618.70, August, 1877. The library has three periodicals devoted to bee-keepers, etc.

MATHEMATICS AND ITS APPLICATIONS.

Pure mathematics are carried only so far as to give an insight into the subjects of surveying and the use of implements—that is, through algebra, geometry, and trigonometry. In Allen's New American Farm Book, mechanics is the first named of a list of studies which the farmer should pursue. Every farmer would put mechanics in a course of study, but every farmer does not know that the shortest road to even an elementary knowledge of the calculation of forces and the direction in which they act is through trigonometry. For the full discussion of these subjects the calculus, a still higher branch of mathematics is required, but with trigonometry quite a clear insight into the problems of mechanical force can be had—without it, it cannot.

The students having completed the pure mathematics, take mechanics, surveying, leveling, plotting and industrial drawing. Civil engineering, embracing the properties of building materials, roads, bridges, farm implements, and some other branches. The classes in algebra and geometry are so large they recite in two or three sections.

Here is ample work for a professor and an assistant. Dr. Pugh, the first president of the Pennsylvania Agricultural College, and whose death the cause of industrial education has much cause to deplore, assigned these studies in his scheme to three full professors and three assistants.

No one man has ever done all that has been done in all these studies, but the persons specially employed up to 1875 for the work have been:

Calvin Tracy, Professor of Mathematics, from 1857 to 1860.

Oscar Clute, a graduate of the College, Professor of Mathematics from 1865 to 1867.

T. C. Abbot, Professor of Civil and Rural Engineering from 1860 to 1861.

Cleveland Abbe, Instructor in Civil Engineering during the year 1859.

Cleveland Abbe has since largely distinguished himself as an astronomer and a general scientific investigator, and he is now the meteorologist of the Signal Service at Washington, having as one of his trusted assistants a graduate of this College.

In 1875 the Department of Mathematics and Civil Engineering was put in charge of Professor Rolla C. Carpenter, a graduate of the College and of the University Course in Civil Engineering, under whose charge it is taken on a more systematic shape.

A short course of instruction is given in astronomy for the sake of the general intelligence conferred on the students by the study, and for its admirable disciplinary use.

The students have practice in what they study. There will be drains to lay out (as well as dig) for many years to come, and hitherto there have been water improvements, dykes or breakwaters, pile driving and bridges and dams to build, foundations for steam pumps and other things to lay. Works of these

kinds are usually put under the supervision of Prof. Carpenter by the Board. He has made an atlas of the College drainage, and a record book, and is engaged in surveys, preliminary to topographical maps of the farm.

Many of the students are competent to do ordinary surveying on completing the study here. No attempt is made to give a complete course of instruction in civil engineering. Those things are taught which are supposed to be most useful for a farmer to know. The University is near for those who would complete their education in this branch of study.

Of book-keeping only enough is taught to enable students to keep their accounts accurately and well. Mr. William D. Cochrane of Detroit was employed in 1859 as instructor and died at the close of the year. John G. Ramsdell, now Judge Ramsdell of Traverse City, and H. D. Bartholomew have both given instruction in book-keeping and lectured on commercial usages and law.

The equipment of this department is meager. It possesses two compasses, for one of which the students contributed $21, a level, a transit instrument and some few other things. Through a borrowed telescope and on a borrowed globe the students are helped to a knowledge of astronomy. There is some, although but little, apparatus for illustration of mechanical principles. The College owns about two thousand models selected from the Patent Office at Washington.

The department has no class-room of its own, no place for the exhibition of its charts and models, no working room for classes in drawing.

ENGLISH LITERATURE.

The department of English Literature is in charge of Professor George T. Fairchild, who, after a year's service in the College as an instructor, received his appointment to the professorship in 1866. The department is made to cover Rhetoric, both in its discussion of style and in the higher study of the invention and presentation of argument.

In the Freshman year a term's study is given to Rhetoric. Students are taught to write with correctness, as to punctuation, expression of thought, and mechanical execution, by means of full instruction, daily exercises in criticism, and weekly compositions. They are also taught to see the value of different kinds of writings preparatory to the enjoyment of the works of English masters of prose and verse.

In the Junior year a term of study is given to the study of higher Rhetoric, involving the nature of argument and of persuasion.

Weekly exercises in compositions and declamations are required of all the Freshmen and Sophomores, and original orations of the other classes.

The French language is taught three terms. The French and German languages are now requisite to the thorough student of any of the sciences or arts. It is part of the design of the course of instruction here to put students in the way of a more complete knowledge than we can furnish them, enabling them to become, if they so desire, specialists in some studies. The experimenter in vegetable physiology, or in feeding stock, or in any other department of scientific investigation, if he will not waste his time, must know what has been done, or is doing, in France and Germany in the same line of study, and the information he needs is not accessible to the mere English student. Both languages are desirable, but one course is not long enough, nor our number of teachers large enough for both. The preference given to French in our course is not due to its higher value, but to the fact that German teachers can be found by students almost anywhere, and to the further fact that French is a

requisite to admission to some Eastern scientific schools to which our graduates sometimes resort, while the German is not. We follow, in requiring French, most of scientific schools of the land.

The danger in an agricultural school where Greek and Latin are not taught, is that in place of these studies there will not be put something calculated to give the student the ability to present his observations, experiments, and reasoning in a way to command attention. The study of another language is a discipline in giving order to one's thoughts, due prominence to the parts of the matter he would write about or speak about, and correctness and force to his expression, and both English and French occupy but scant time for the securing of these results.

In the Junior year a term's course of lectures is given to English Literature. A connected and philosophical review of this literature is given, and an attempt made to imbue the students with a love of reading. The Juniors read select dramas of Shakspeare and the Seniors portions of Milton in evening classes. As the students have a very efficient society for the study of science, so the societies and clubs of the College have done excellent work in the reading of poetry, history, political economy and other branches of study. The library furnishes a fair supply of good works to read.

POLITICAL ECONOMY, PHILOSOPHY.

History.—In the Freshman year a term's study is given to the history of Greece and Rome. It is a mere beginning of historical study, but serves an educational purpose in interesting the student in history. Most of the Professors give a lecture or two on the history of the subjects they teach, and the study of the Constitution of the United States is preceded by some study of United States History.

Philosophy.—Psychology receives a term's study; Moral Philosophy one-half term; Political Eeconomy one-half term's lectures by Professor Fairchild; Inductive Logic one-half term, and the Constitution of the United States one-half term. "A farmer," said President Williams in his inaugural address in 1857, is a citizen amenable to the laws, and, in a humbler or a wider range, may become an exponent of society. He should be able to execute, therefore, the duties of even responsible stations, with self reliance and intelligence."

There is great need of instruction in the branches of study just named. With as equal a distribution of work as we could devise, Professor Ingersoll, with the care of the Farm Department upon his shoulders, takes classes in French, and if French were not taught at all, it would be in whatever else took its place. Professor Beal takes History entirely apart from his own department, and Professor Fairchild is weighed down with the many studies assigned to him. In our desire not to increase the expenses of the College we have let the College grow from the period when two small classes were united in their studies to a condition when the higher classes are too large to unite, and when the lower ones are so large as to have to be divided into sections, with no corresponding increase of teaching force.

LECTURES.

Another element of instruction is a series of fortnightly lectures given to the students in a body by the members of the faculty in rotation. Sometimes the place of some professor is supplied by some gentleman outside of the College. In these lectures there is a wide range of topics. Thus during the present year

lectures have been given on the Orations of Demosthenes and Aeschines on the Crown, on the Liquifaction of Gases, California, Illumination, The Choice of a Business, Mouths of the Mississippi and Engineering works on them, Shorthorns, Polish True and Mock, A Course of Reading in English History, Reproduction of Plants (by Mr. B. C. Halsted), Sympathy, the Soul of Oratory, Snakes, Horticultural Experiments at the College, The Currency (by W. S. George).

MILITARY INSTRUCTION.

On the breaking out of the rebellion the students formed themselves into a company and had regular military drill. Governor Blair once visited the company, and addressed it while on parade. Drill was afterwards required of the students, and lectures were given (1863) on Military Hygiene by Dr. Kedzie, and on Field Fortifications by Professor Clute. Guns were furnished by the State and subsequently withdrawn.

At present, military drill is a voluntary matter with the students. An armory has lately been fitted up and the State has furnished us with sixty stand of arms, breech-loading Springfield rifles, and accoutrements, a drill ground has been made ready, and the company, fifty-four in number at the close of last term, drills twice a week. The company has encamped from time to time away from the College.

The College Cornet Band has furnished music at times for the parade. This Band consists of fifteen pieces, and has property in instruments and books to the amount of $95.60.

The interest manifested in military instruction is good, and is increasing. Whatever has been done among the students is due chiefly to the labors of Professor Ingersoll, their captain, whose experience of several years in the army fits him to be the leader in this movement.

It may not be generally known that by a law of this State the Agricultural College is a military School. Yet so it is, as one may see by turning to the 364th page of the laws of 1863. No appropriations for the Military School have as yet been made by the Legislature, and the College waits for the time when the interest of the Congressional Land Grant shall enable it to equip this department of instruction.

SOCIETIES.

I have now given an account of the various departments of instruction. The Library of about 5,000 volumes and an extensive Reading Room are daily opened to students, and they have the further privilege of drawing out books to read. The Societies formed amongst the students although of a voluntary origin and nature are great helps to the students, and may find a fitting mention here. The most general societies are the Christian Union and the Natural History Society.

The Christian Union has a library of several hundred volumes, mostly purchased by the society. It takes charge of the prayer meetings, Sunday schools, and Bible classes, and has lectures and entertainments from time to time.

The Natural History Society is made up of students and professors. The members are divided into five sections, Botany, Chemistry, Geology, Zoölogy, and Scientific Methods. The meetings are held once a month, and its transactions are reported in both the Lansing newspapers. The society has a library

of one hundred and thirty-six volumes, and a museum of 1,350 specimens, exclusive of cases of insects.

Much original work is done by the members of the society, and each one takes to the meetings his newly made observations, his queries, and the discussions are free, animated, and instructive. The more formal papers for the last year were as follows: "The Amazon," by Professor J. B. Steere of the University. "The place of Definition in Science," by President Abbot. "The Signal Service Barometer," by Dr. Kedzie. "Exactness of Expression in Science," by Professor Fairchild. "The Grape-vine Phylloxera," "The Mound of Newark, Ohio," and "Persistence of Life in the Embryonic Chicken," by Professor Cook. "Autumn Leaves," "A Shower of Angle-worms," and "Method of Study in Natural History,"by Professor Beal. "Method of Least Squares," by Professor Carpenter. "The Telephone," by Professor William K. Kedzie. "The Carrion Mushroom," and "Adulterations in Food," by Mr. Robert F. Kedzie. "Development of the Chick in the Egg," by Mr. W. C. Latta. "Grain experiments," by Mr. C. E. Breck. "The Fall of Leaves, and the Growth of Roots," by Mr. A. A. Crosier. "The Cuttle Fish," by Mr. E. Davenport. "How much does a Fly weigh?" "The Manufacture of Quinine," "Analyses of Water from wells at the College." by Mr. C. T. Gage. "Our Winter Birds," by C. W. Gammon. "Bumble-bees," "Report of Mound Explorations at Pine Lake," by N. P. Graham. "Wing Scales of the Papillionidae," "European Grain Moth *(Tinea granella)*," "Evidences of Glacial actions in Michigan," by F. W. Hastings. "Building Power of Leaves," by W. R. Hubbert. "Bees on Irregular Corollas," by A. Jones. "Iron as a Coloring Agent in Flowers," by E. O. Ladd. "Germination of Seeds," by H. E. Owen. "Chemistry of Photography," by A. B. Peebles. "Nature's manner of Sowing her Wild Oats," by R. D. Sessions. "Angle Worms," "Plant Lice," by F. E. Skeels. "Outcrops of Rocks in Michigan," by C. J. Strang. "The Dearth of Terrestrial Animal Life during the age of Coal Plants," by C. F. Davis. "Some Water Plants," by Byron D. Halstead.

The other societies of the College have the past year taken up systematic study in history, literature, science and philosophy, and have materially shaped the reading of the students.

THE GRADUATES.

A class of thirty is to be graduated in November. Not counting these, the College has graduated one hundred and fifty-six. Four of these are not living, and the occupation of eleven is not known to me at this time. Of the remainder, fifty-five are farming, seven are in fruit culture, three in bee-keeping, and eleven giving instruction in science and agriculture in colleges, making fifty-four per cent. of the graduates. In an address which I gave before the Legislature, and which is to be found in the report of the Board for 1874, pages 64 to 85, I showed that other kind of colleges sent less than two per cent. of their graduates to farming.

Our graduates show that a love of knowledge has been infused into them, by frequently returning to study or by resorting to other institutions of learning to continue their studies. They have gone from us to the University, to Cornell, Yale, Harvard, England, France, and Germany to continue their studies. Beside the five graduates retained as workers in this College, several others have found places in colleges. The Professors of Agriculture in Kansas Agricultural College and in the Missouri University, the Professors of Botany and Horti-

culture in Cornell and in Iowa Agricultural College, and the Professors of Chemistry in the University of Wisconsin and in Oberlin are graduates of this College. The farmers among the graduates are rising in influence as they increase in experience, and it is certain that a greater number would be found in the farming ranks but for the fact that farming requires a large cash capital to begin with, while many if not most of our graduates have only their health, education, and good habits for capital when they leave college. But the knowledge gained here will be of use to them and to society in whatever calling. Their knowledge of agriculture and its needs, and sympathy with men in that business, will be of value to agricultural interests.

FARMERS' INSTITUTES.

The College, in 1876, inaugurated the holding of Farmers' Institutes in the winter vacation, six each year, in different parts of the State. The citizens of the vicinity where they are held furnish one-half the lectures and addresses and participate in the discussions. These institutes have been very successful, and full reports of them appear in the successive reports of the Board of Agriculture. A sketch of the beginning of this work will be found in the report for 1875, page 72.

CLOSING REMARKS.

Eighty years ago there was not a school of Agriculture in the world. There are now thirty-nine in our own country. All of these, except our own and the one in Pennsylvania, were established subsequently to a grant of lands made by Congress in 1862. In no State does the College have so honorable a beginning as in ours. The people themselves in establishing their constitution made its establishment imperative. Its language is "The Legislature shall provide for the establishment of an Agricultural School." The origin of no other agricultural college rises so near the primal source of power. No other State has been so patient with the failings, so hopeful in the progress of its Agricultural School, nor so constant in its appropriations for its support. Criticisms it has had freely, and sometimes adverse votes enough to make its friends tremble; but more farmers have voted to sustain it than have voted against it, in every Senate and House of Representatives from the first session after its establishment to this day. They have seen that the education given in the schools and colleges of the land were not at all planned for the farmer's benefit. Of course it would do the farmer good to go through college and learn its Greek and its calculus, but the liberal education imparted in these Colleges had close relationship to the learned professions as they were called, and no peculiar adaptedness to the wants of the agriculturist.

From this felt need in the better educated farmers of our land have sprung into being these colleges—not that they believed all young men would flock to them, but that they deplored the general indifference of their class to such an education as should make them acquainted with the philosophy of their occupation. There were in 1857, the date of the opening of the Michigan Agricultural College, almost no special students of agriculture in our land. The students now in these colleges exceed four thousand.

The House of Representatives at Washington appointed a committee of eleven to examine into the condition of these colleges. The report was made in January, 1875—was unanimous, and says, "A considerable number of these colleges have done work which requires no apology, and a few of those earliest

organized have already found time to take high rank among the institutions of our land. The number of students in attendance upon these schools is between three and four thousand [4,211 in 1876], and they have furnished more than sixteen hundred graduates to the active occupations of life. They are generally gathering around themselves material appliances in the form of farms, stock, workshops, machinery, books, and apparatus. * * * There is evidence of an honest purpose to make the studies pursued such in variety, in extent, and in value as shall meet the requirements of the law to which they are indebted for their endowment. Studies connected with agriculture and the mechanic arts are made prominent if not paramount, and there is reason to believe that by this means the taste for those branches of knowledge has been considerably increased in the whole community.''

REPORT OF THE FACULTY TO THE STATE BOARD OF AGRICULTURE.

The Faculty of the State Agricultural College respectfully submit to you their annual report for the year from October 1st, 1877, to September 1st, 1878.

COMMENCEMENT OF CLASS OF 1877.

The College term which was in session at the writing of last year's report, closed November 20th, with the commencement exercises of the class. The accompanying exercises were the Baccalaureate sermon on Sunday the 18th, the class day exercises on the evening preceding commencement day, and the President's Reception. The music for the occasion was furnished by the Hayden Quintette Club of Detroit. The class motto was "Resolve and Conquer," and the programme was as follows:

PROGRAMME.

Music.

Quintett—Grand march from Le Prophet, ... *Meyerbeer.*

Prayer.

Violin Solo—Lombardi Fantasia Brilliante,	*Singler.*
The Signs we Hang Out,	Charles Bloodgood, Cassopolis.
The Truth-Seeker's Authority,	Albert Dodge, Jackson.
What's His Business?	Charles Sanford Emery, Lansing.
Piano Solo—Concerto in Bb,	*Mozart.*
Self Made,	William Oliver Fritz, Pompeii.
Training to Think,	Charles Irving Goodwin, Ionia.
Inducements to the Study of Science,	Mason Wilbur Gray, Pontiac.
Flute Solo—Ballad,	*Terschak.*
Political Training,	Edson Hale Hunt, Saranac.
The Possibilities of Michigan Agriculture,	*Frank Stewart Kedzie, Lansing.
Culture and Agriculture,	William Carroll Latta, Legonier, Ind.
Humbugs,	Lyman Augustus Lilly, Allegan.
Quintette—Symphonia in Eb, 1st movement,	*Hayden.*
The Unsolved Problem,	Arthur Bradley Peebles, Mason.
The Winners in the Contest,	James Albert Porter, West Ogden.
A Use for the Beautiful,	John Adelbert Poucher, Morenci.
Violin Duet—Swiss air with variations.	

* Excused on account of illness.

Theory and Practice, ... Albert Barnes Simonson, Birmingham.
Assassination as a Historical Factor, ... Bion Whelan, Hillsdale.
Piano Solo—La Polka de la Reine Caprice, ... *Raff.*

Conferring of Degrees.

Quintette—Selections from Il Trovatore, ... *Verdi.*

Benediction.

The degree of Master of Science was conferred at the same time on Mr. Charles L. Ingersoll, of the class of '74, now Professor of Agriculture in the College. The degree of Bachelor of Science was conferred on all the members of the graduating class, viz.:

Charles Bloodgood, Cassopolis.
Albert Dodge, Jackson.
Charles Sanford Emery, Lansing
William Oliver Fritz, Pompeii.
Charles Irving Goodwin, Ionia.
Mason Wilbur Gray, Pontiac.
Edson Hale Hunt, Saranac.
Frank Stewart Kedzie, Lansing.
William Carroll Latta, Ligonier, Ind.
Lyman Augustus Lilly, Allegan.
Arthur Bradley Peebles, Mason.
James Albert Porter, West Ogden.
John Adelbert Poucher, Morenci.
Albert Barnes Simonson, Birmingham.
Bion Whelan, Hillsdale.

The students in attendance since the last annual report have been as follows:

Graduating class and others in attendance during the autumn term of 1877, but not present in 1878	38
Resident graduates 1878	1
Senior class of 1878	31
Junior class of 1878	27
Freshman class of 1878 (class of 1881)	117
In select courses	8
Total for the year	222

There was a large accession of students into the Freshman class on the opening of the spring term, owing to the fact that heretofore the College year has commenced at that time.

The absence of a Sophomore class during the spring and summer terms of 1878, is owing to the burning of a Dormitory in December, 1876. Lack of room for a new class necessitated its postponement until September, 1877, and the first Tuesday in September has now been adopted as the beginning of the College school year.

The Senior and Junior classes having entered in February (before the burning of the hall) will be graduated in November, 1878 and 1879. From this change of time in beginning the year it happens that for two terms of each year at present, there are but three classes in the College.

The Freshman class become Sophomores at this time, August 31, 1878, and a new Freshman class enter on the third of September.

The average age of each of the classes present in 1878 is as follows:

Seniors	$21\frac{1}{4}$ years.
Juniors	$20\frac{1}{2}$ "
Freshmen	19 "
Select studies	21 "

The various counties of the State are represented by students as follows:

Van Buren	12	Cass	4
Oakland	15	Montcalm	4
Ionia	11	Genesee	2
Lapeer	4	Newaygo	1
Lenawee	5	Monroe	5
Ingham	21	Otsego	1
Saginaw	1	Hillsdale	4
Shiawassee	2	Ottawa	4
Clinton	3	Bay	1
Macomb	4	Branch	2
Wayne	13	Washtenaw	1
St. Joseph	9	Mason	3
Kent	4	Berrien	4
Livingston	2	Mecosta	1
Allegan	7	Calhoun	3
Eaton	4	Barry	1
Jackson	5	Gratiot	1
Clinton	1	Grand Traverse	3
Tuscola	1		

Total number from Michigan 169

Number of students from other States:

New York	3	Nebraska	1
Wisconsin	2	California	1
Indiana	4	Illinois	1
Connecticut	1	Denmark	1
Kentucky	1		

Total number from other States 15

JUNIOR EXHIBITION.

The Junior Exhibition took place August 27th. Ten were selected by lot from those whose class standing was above eight, and these spoke in alphabetical order according to the following full programme:

PROGRAMME.

Overture de Concert, ... *R. Speil.*

Prayer.

Waltzes—Melodische Wogen, ... *Rukenschuh.*

The State and Education, ... Joseph A. Briggs.
The Future of Turkey, ... Louis G. Carpenter.

Selections from Il Trovatore, ... *Verdi.*

American Haste, ... Clifton B. Charles.
The Trained Observer, ... Thomas E. Dryden.

Polka, ... *Bosquet.*

Science and Truth, ... Nathan P. Graham.
A True Life, ... Charles D. Phelps.

Potpourri—from Lucretia Borgia, ... *Donizetti.*

Music as a Means of Culture. . . . . Eugene J. Rauchfuss.
Our Mission to Industry. . . . . Marcus S. Thomas.

Galop—Thunderstorm, ... *Schubert.*

National Security, ... Willard L. Thomas.
The Farmer's Need of Science, ... Harry Wilcox.

Reveil du Lion. . . . . *Kontzky.*

Benediction.

The music was furnished by Whitney's Opera House Orchestra of Detroit.

The instruction given in the class-room has been in accordance with the following scheme of class-room exercises:

SPRING TERM.

	8 A. M.	9 A. M.	10 A. M.	11 A. M.
Seniors.......	Moral Philosophy.	Constitution of U. S., 6 weeks. Political Economy, 6 weeks.	....	Physiology.
Juniors.......	....	Mechanics completed, 6 weeks. Drawing, 6 weeks.	Agricultural Chemistry.	Horticulture.
Freshmen......	Agriculture....	Book-keeping, 6 weeks. Botany, A Section.	Algebra, A Section. Botany, B Section, 6 weeks.	Algebra. B Section.

SUMMER TERM.

	8 A. M.	9 A. M.	10 A. M.	11 A. M.
Seniors.........	Mental Philosophy.	Agriculture.	Zoölogy 6 weeks. Geology.	
Juniors.........	Entomology.		Rhetoric.	Physics.
Freshmen..	French A. Botany B. Geometry B.	French B. French C.	Geometry A. Botany C.	Botany A. Geometry B.

August 12th the Freshman class dropped the study of French to take up elementary chemistry.

The scheme for the autumn term, commencing September 3d, will be:

AUTUMN TERM.

	8 A. M.	9 A. M.	10 A. M.	11 A. M.
Seniors.........	Botany A, 6 weeks.	Botany B, 6 weeks. Landscape Gardening.	Civil Engineering.	Logic.
Juniors.........	Astronomy, 6 weeks. Anatomy, 6 weeks.	Meteorology.		English Literature.
Sophomore.....	French A.	Geometry A. French B.	Geometry B.	Elementary Chemistry.
Freshmen	Composition and Rhetoric A.	Algebra A. Composition B.	History B.	Algebra B. History A.

Each class has had weekly meetings for rhetorical exercises in charge of some officer. Further accounts of the institution will be found in the reports of the several officers.

VETERINARY.

Among the subjects named in the law of the State to be embraced in the College course of study, is the Veterinary art. Instruction has been given in it to a limited extent by the professor of Practical Agriculture. But the faculty are of the opinion that the College should begin at once to enlarge its instruction in this branch. A committee of the faculty appointed last spring to consider the subject, after reporting in favor of a hospital, and a professor who should lecture one term to the students of some class, who should be required to attend, and one additional term to those who should take the study as an elective, recommended as the least that we should request of the Board, the employment of an instructor of acknowledged qualifications in Veterinary, to give lectures during the summer term of each of the years 1879 and 1880, and that if possible the engagement cover a week of institute work in the winter. The faculty request of the Board the engagement of a lecturer for at least one term in each year.

LIBRARIAN.

The duties of the professor of English Literature,—the present librarian,—are very onerous, owing to the drill given to students in composition and orations; and to the necessity of giving instruction in studies without as well as within the range of his own department. Neither he nor any other officer, has time to give to the Library the attention it needs. During the next term, in as even a division of labor as can well be made among

the officers, the professor of Agriculture, who ought to have no duties outside his own wide and important department, has two classes to hear daily in studies having no immediate relations to agriculture. The faculty ask for the employment of a person who shall act as Librarian, and instructor in languages, for the next two years.

FARMERS' INSTITUTES.

The third annual series of six Farmers' Institutes was held during the month of January. They were held in Marshall, Paw Paw, Tecumseh, St. Johns, Saginaw and Climax. They were well attended in the several localities, by the farmers who contributed at least one-half the addresses on each occasion. The duties connected with these institutes consume the larger part of the only vacation enjoyed by the professors of the College, two recesses of a week each, excepted. But the advantages to the institution of these meetings with the farmers are so great that the faculty would not have them given up. They hope, with increased prosperity of the College, relief from the hard tasks that press upon them through the entire year, in additional help and a greater division of labor.

A detailed account of the institutes has already been published in the Report of the Secretary of the State Board of Agriculture, for 1877, the delay in publishing permitting such a report to appear in that volume.

STUDENTS' SOCIETIES.

The societies formed amongst the students have been active and prosperous.

The Students' Government association has maintained such order in the halls as has been satisfactory to the students in them.

The College Cadets have had arms and accoutrements furnished by the State, and have drilled regularly.

The College Cadet Cornet Band has also practiced regularly, and to the gratification of those who have listened to them.

The Delta Tau Delta, Phi Delta Theta, and Union Literary Societies have fitted up the rooms assigned them by the Board, and several other societies have been formed for literary work, and most, if not all of them have worked in a prescribed plan of study.

The Christian Union has maintained its Sunday school and prayer meeting, and has given one public entertainment.

The Society of Natural History has been chartered during the year. Its members are divided into five sections,—Botany, Chemistry, Geology, Zoölogy and Scientific Methods. Many of the papers read before the Society are, in our opinion, worthy of publication, and the faculty recommend that a selection of them be printed in the Annual Reports of the Secretary of the Board. The Society has a library of 136 volumes, and a museum of 1,350 specimens, exclusive of entomological specimens in cases. It is very much in need of rooms.

DORMITORIES.

The new dormitory for students was finished and accepted by the Board February 7, 1878. It is called Wells' Hall, in honor of the President of the Board, Hon. H. G. Wells, who has served on the Boardsince its establishment in 1861. Wells' Hall contains 69 students' rooms, all but eleven being large enough for two students. The number of students it will accommodate is 127.

The boarding hall, called Williams' Hall, in honor of the first President of

the College, can accommodate 75 students. The total dormitory accommodations for students in the College is 202. There are 142 students now occupying the rooms, leaving but 61 places for the new freshmen class to be received in September. Thirty-one seniors go out in November, so that number additional can be admitted in the spring, if they come at that time qualified to enter a class advanced one term in algebra, history, rhetoric and composition. It is evident that the question of more room must soon present itself to the Board.

OTHER NEEDS.

The chemical laboratory will need enlarging for another class,—both the lecture room and the working room. The botanical department should have a working laboratory and lecture room, and museum in a building especially devoted to it; and the general museum is growing beyond the limits of the small accommodations it now has.

The College has been the recipient during the past two years of many visits from farmers, coming in granges, clubs, or in small parties. By this means, and by the winter institutes, the practical character of its instruction is becoming more widely known.

T. C. ABBOT, *President.*
R. G. BAIRD, *Secretary.*

REPORT OF THE DEPARTMENT OF CHEMISTRY.

To the President of the State Agricultural College:

I herewith present my report of the Chemical Department for the Collegiate year now closing.

At the time of making my last report, my Assistant in Chemistry and myself were engaged in the chemical analysis of a large number of varieties of wheat raised in this State, and in an elaborate investigation of the comparative food value of the flour of these varieties of wheat. This work required seventy-seven separate analyses of wheat and flour, besides a vast number of experiments to determine their comparative value. Nearly the whole of the winter vacation of both of us was consumed in this work, and in attending the Farmers' Institutes. While this work laid a heavy burden on the Department, it was cheerfully borne because the people received the benefit, and the College could thus repay the State, in part at least, for the large sums which had been expended in its support. When the results of these investigations were published the price of Clawson wheat rose 10 cents a bushel in all parts of the State, and instead of being graded as "No. 3, red," it was everywhere graded "No. 1, white." Many farmers have endorsed the public declaration of one of their number that this "analysis had saved to the farmers of Michigan more than the Agricultural College had ever cost them."

The Committee on Education of the State Grange made a report which was adopted at their annual meeting last December in which it was said "if this investigation had been made sooner it would have saved to the farmers of this State millions of dollars." Yet the same effort to decry Clawson wheat

and depress its price was again made in the State Millers' Convention this summer. Resolutions denouncing Clawson wheat were introduced into the Convention; but after the examination which had been made on this subject at the Agricultural College, and the public demonstration of the value of Clawson wheat and flour which was made at the Farmers' Institutes of last winter, the convention of Millers refused to pass these resolutions. If the Agricultural College had not made this investigation does any one doubt but that these resolutions would have passed, and that Clawson wheat would to-day be quoted at 10 cents below other varieties of "No. 1 white wheat"? In such ways is the College vindicating its claim to be the servant and helper of the farmer.

FARMERS' INSTITUTES.

I attended four Farmers' Institutes, viz.: Marshall, Paw Paw, Tecumseh, and Climax. At all of these Institutes I delivered my lecture on "The Food-Value of Different Varieties of Michigan Wheats;" and at Paw Paw and Tecumseh a lecture on "Healthy Homes for Farmers." The Detroit Free Press published a very full abstract of the last address, and I have seen extracts from it in a great number of papers. The State Board of Health published 6,000 copies for distribution in the State: a gentleman in a neighboring State ordered 500 copies to distribute in his district.

My Assistant attended the Farmers' Institute at St. Johns, and read a valuable paper on "The Signal Service as Related to Agriculture."

STATE BOARD OF HEALTH.

I have continued to discharge the duties devolving upon me as member of the State Board of Health. It is difficult to clearly describe the duties and responsibilities which attend such a position, but amid all its labors and cares one has the satisfaction of knowing that all its aims are the advancement of human well-being. I have attended all the meetings of the Board, and have prepared various papers for the Annual Report. In behalf of the Board, I attended the meeting of the Social Science Association at Cincinnati during the spring vacation; also made a visit to Saginaw to inspect and advise with regard to a school building, afterwards writing out an elaborate paper on the subject for the use of the School Board.

I have been appointed Health Officer for the township of Lansing, and recognizing the principle that the public have the right to command the assistance of every one in promoting the public health, I have accepted the position.

METEOROLOGICAL OBSERVATIONS.

The tri-daily meteorological observations have been continued during the year, and monthly reports furnished to the Smithsonian Institution, and weekly reports to the Lansing Republican. Meteorological observations have been kept continuously since April, 1863. They are the only observations in the State covering the same period which have been given to the public.

PUBLIC LECTURES.

I have given two public lectures before the Faculty and students, one on "The Bankruptcy of the Gases," and the other on "The Means of Obtaining Artificial Light."

CLASS-ROOM WORK.

In consequence of the readjustment of classes (made necessary by the burning of one of the dormitories in 1876), so as to bring the close of the college

year at the 1st of September instead of December, I have had a smaller number of classes this year than usual. This comparative respite from teaching has given my assistant and myself an excellent opportunity for work for the public outside of the class-room. In the spring term I gave a full course of lectures to the junior class in agricultural chemistry, the topics being illustrated and enforced by appropriate experiments. In the summer term I had the class in chemical physics, the topics being illustrated by a very complete system of experiments and physical demonstrations. I have also given ten lectures on elementary chemistry to the freshman class, preparatory to their entering upon this study in the sophomore year. The total number attending these lectures is 88. The entire number of students I have under my instruction during the year is 120.

Two students have worked in the laboratory at quantitative chemical analysis during the spring and summer terms.

INDIAN CORN.

In the Farmers' Institute held at Paw Paw last winter the question was raised concerning the fat-producing properties of different varieties of Indian corn, and the wish was earnestly expressed by a number of farmers that I would make analyses of a number of different varieties of Indian corn to aid them to come to an intelligent conclusion concerning the value of different varieties of corn for fattening purposes. In entering upon this work I asked the farmers to furnish the varieties of corn they wanted analyzed. David Woodman 2d, of Paw Paw, furnished eight kinds, Geo. H. Kedzie one kind, the farm department of this College three kinds, and Charles Joslyn, of Indianapolis, one kind. These 13 specimens have been carefully analyzed to determine the amount of water, ash, albuminoids, starch, fat, sugar, gum, and cellulose or indigestible fibre.

These specimens are put up in three quart show bottles; the printed labels posted on the side of each show-bottle will exhibit the name of the variety, of the person who presented it, of the locality where it was raised, and the complete chemical analysis. The bottles and contents will be exhibited at the Fair of the State Agricultural Society. I desire to have 2,000 slips printed which shall contain all information in regard to all these specimens of corn, to be distributed at the Fair to such persons as are interested in this subject.

The number of published analyses of American grains is comparatively small. Most of the published analyses of grains have been made by European chemists, and the grains for the most part were raised in Europe. The conditions of climate, soil, and culture are so different from those found in this country that the analyses of European grains are of small value to the American farmer. It would seem eminently proper that the Agricultural Colleges of this country would furnish this information by making and publishing a complete analysis of all the varieties of grain raised in the United States. The analyses of different varieties of wheat made here last year, and of different varieties of Indian corn this year, are the contribution of the Michigan State Agricultural College towards securing this desirable result.

SOIL ANALYSES.

A vast region lying north of us, usually grouped together as "the northern counties," has only slowly and tardily acquired population because of the unfortunate and mistaken impression that this country was "good for lumber and good for nothing else"—that when the lumberman has swept off the val-

nable timber, there was nothing left to attract the settler. As a consequence of this erroneous supposition, men of other States and men of our own State, when seeking for new lands to make new homes, have turned their backs on ready markets, available transportation, schools and churches, security and civilization, to seek in the far west their resting place amid the wild disorder, discomfort, and insecurity of border life. They reached for sunset and grasped a shadow. So far as soil alone is concerned they "have gone farther and fared worse:" when we take into account the conditions of climate, the want of markets, and above all, the absence of that civilized and orderly society which alone commands security for all and safety even for the weakest, we see how grave is the blunder which has led them to pass by Michigan while seeking homes in Kansas, Nebraska, Dakota, or, turning their weary feet to "the sunny south," only to encounter the deadly fevers and wasting malaria of that deceptive clime. The great mass of these restless wanderers have rejected Michigan as a home because they were in absolute ignorance of this region—of its soil, productions, capabilities for cultivation, and its adaptedness to make a desirable home.

On account of this wide spread ignorance in regard to our northern counties even among our own people, I called the attention of this honorable Board to the desirability of taking steps to bring the Agricultural capabilities of the northern counties to public notice, and, "by and with the advice and consent" of the State Board of Agriculture I devized a plan to gather representative specimens of soils from these counties; these soils to be chemically analyzed, and then exhibited at the State Fair, in order to draw public attention to the quality of these soils, and to afford a scientific basis for estimating their agricultural capabilities by exhibiting their chemical composition. By placing these soils side by side, an opportunity for comparison is afforded seldom found when the soils are in their natural position.

In order to awaken interest in this subject and to secure specimens of soil from as many representative points as possible, I issued the following circular which was printed in the Lansing Republican, and was copied into nearly every paper in the State. The press have taken a deep interest in this work, and afforded me every assistance within their power, for which I desire to express my sincere gratitude:

MICHIGAN SOILS.

To the Land-owners of our State:

So little is known to the public of the kind and quality of the soil in the northern counties of the lower peninsula that the tide of immigration is sweeping by Michigan to occupy poorer lands farther from good markets. To bring to public notice the undeveloped agricultural resources of our State, I am gathering specimens of soil to be analyzed at this laboratory, and then to be exhibited at the State Fair in Detroit. It is my plan to arrange these specimens of soil in large glass jars, side by side, a label attached to each jar stating the locality from which the soil comes, the kinds of timber growing on it, and the chemical analysis of the soil. In this way it is hoped that persons attending the Fair may directly compare soils from a large number of places in our State.

To carry out this design, I am obliged to ask the aid of persons of energy and public spirit in the various sections of our State in gathering and forwarding to me specimens of soil for this purpose. I want a fair specimen of the surface soil from each county north of the base line. I do not want soils selected for their extraordinary properties, but only a specimen which shall *fairly represent the average soil of any given county or district.* It is very easy to select soils which will misrepresent the average quality of soil in a district, but such selection will be of very little value.

In sending the soil I want at least one bushel of surface soil to be placed in a clean box or keg, and marked so that I can identify the place from which it comes.

The person sending the soil will please write me at the same time, stating the locality from which the soil is sent, the kind of timber growing on such soil, and the route by which the package is sent. *Send as freight in all cases.*

In counties where there is an agricultural society, I would suggest that the secretary take this matter in charge, and send on the soil at an early date: it must be sent early to insure its analysis, because this is a slow process.

Persons wishing further information in regard to the manner of collecting and forwarding specimens may secure such information by writing to me.

If the land-owners of this State will take hold of this matter at once, I think something can be done to attract public attention to the great value of our unimproved lands for agricultural purposes, and secure a share of the immigration which now passes by on the other side. R. C. KEDZIE.

State Agricultural College, April 20, 1878.

After this circular was issued I received quite a large number of specimens of soil from various parts of the State, and I received notification of many other specimens sent, which for some reason never reached me. Thirty-two specimens of soil have been analyzed and mounted for exhibition at the State Fair. A few specimens that were received have not been analyzed,—two because they were received too late to be analyzed in time for this exhibition, and the rest because there was no mark by which to identify the locality from which they came.

For purpose of comparison, a few soils have been introduced into this list, such as the noted "bottom lands of River Raisin," and the famous "burr-oak wheat lands." By comparing the chemical composition of these lands with that of the new lands of our State, some estimate may be made of their agricultural capabilities so far as the chemical composition is concerned; the opportunity is afforded at the same time of comparing their physical properties.

Perhaps I cannot place before you in a clearer light the estimate placed upon this effort, on the part of observing men of our State, than by extracts from letters I have received on this subject. The first is from a letter written by a member of the last Legislature: "You have struck the key note, both for the vast unimproved portions of this part of our State, and for the Agricultural College. I do not have any faith in soil analysis to determine just what elements must be added to produce a certain crop; but I have great confidence that soil analysis will place in their true light the soils of a section as to whether the immigrant can afford to take them or not. This is all we want here, *i. e., to be truly known.*

"Now is the time to set the ball rolling for the Agricultural College. We want the public to understand that the Agricultural College has an interest in every section, and is working to build them up; so that at another Legislature we shall not have to beg an appropriation."

The next is from the cautious and discriminating Governor of our State: "I rejoice that you have taken hold of this subject, as I believe that the productive properties of the soil in the newer parts of the State are not generally appreciated or understood. Other interests, such as lumbering and mining, have occupied attention almost exclusively there, and the value of the soil has been in a great measure overlooked. I am confident that your work if thoroughly carried out will result in demonstrating that these portions of the State are admirably adapted to the pursuit of agriculture, and that it will tend to rapidly promote their settlement and growth."

In order to disseminate the information to be derived from this investigation and exhibition of soils, I ask to be allowed to print 2,000 slips containing the analysis, and other information respecting these soils, for distribution to the public press, and to visitors at the State Fair.

SPECIAL APPROPRIATIONS.

The special appropriation made by the last Legislature to buy chemical apparatus for the Laboratory was in part diverted to pay the necessary expenditures required for carrying out the special investigation in regard to the food-value of Michigan wheats, made last year, and the expenditure required to collect, analyze, and properly exhibit the soils from the northern counties, made this year. I think the public will approve the expenditure of money for such purposes; but to prevent such diversion of a fund in the future, I ask that the Board include in their estimates for 1879 and 1880, the sum of $250 for each year, to defray the expenses of special investigations in the chemical department. I also ask that the sum of $500 be included in the estimates for each of the years named to buy apparatus required in the Laboratory, and especially required for certain proposed investigations in regard to the food-value of grasses and forage plants. The price of one instrument required for such an investigation is $225.

MORE ROOM.

The building of the Laboratory was made necessary by the large influx of students. When it was built the lecture-room was supposed to be large enough to meet the wants of the College for all time, as it would seat 80 students, while it was expected that the analytical room, which affords work-room for only 48 students, would require to be enlarged at some future day. But the students attending lectures in elementary chemistry this term number 88; and when this class enters the analytical room next year, there will be work-room for only about half their number. In eight years we have outgrown the Laboratory, and I now take up the words of the prophet of old: "the place is too strait for me; give place to me that I may dwell."

The plans and estimates for the required changes will be laid before the Board at an early date.

ASSISTANT IN CHEMISTRY.

My Assistant in Chemistry has been my right hand in the work of the year. Besides the invaluable assistance in the analysis of corn, and of soils, he has made independent investigations in regard to the composition of milk, and of honey, the results of which I hope to see placed before the public at an early day.

All of which is respectfully submitted.

R. C. KEDZIE,

Prof. of Chemistry and Curator of Chemical Museum.

AUGUST 26, 1878.

REPORT OF THE PROFESSOR OF ENGLISH LITERATURE.

To the President of the College:

In this report of duties connected with my professorship, I shall not include matters pertaining to the oversight of the College Library, since these can better be presented in a separate report.

The three classes under my charge on September 30th, 1877, completed the

courses assigned, having their examinations at the close of the term in November. The Junior class, in English Literature, seemed much interested throughout the course of about fifty lectures. The course covered, beside a brief outline of the history of the English language, the history of English literature by periods and prominent authors to the close of the eighteenth century. I was able to give also a cursory glance at the leading American authors down to the present day. Of the thirty-one members enrolled, twenty-seven passed the final examination, and three of the four excused from College before the close of the term, have since passed a special examination.

The two divisions of the Freshman class in composition, together numbering fifty-eight, finished the usual task in Hart's Composition and Rhetoric, and prepared more than six hundred exercises for my correction. These exercises varied in nature from a simple business letter to an elaborate description of a complicated machine. Each member was required to present eleven exercises, and a part of the final examination was a carefully prepared letter giving the advantages and disadvantages of their term's study. Forty-four of the class passed examination successfully, six failed, and eight left before the close of the term. Seven have since passed a special examination.

In the Spring term of 1878, the Senior class was under my charge in Moral Philosophy twelve weeks, and in Political Economy six weeks. The class, numbering thirty-two members, went over the whole of Fairchild's Moral Philosophy with a review each day and a final review of the whole. All passed a satisfactory examination. The usual course of twenty-five lectures in Political Economy was by special request extended to thirty, the usual review before examination being omitted. I also prepared for the use of the students a brief printed synopsis of the subject as presented, which, though too concise to serve for more than a topical index, served to add interest and appreciation of the subject. The class numbered thirty, and all passed the final examination, except one who was absent on account of illness.

During the Summer term, I have had in charge the Junior class in Whately's Rhetoric and two of the three divisions of the Freshman class beginning French, The Juniors and others, twenty-nine in number, seemed much interested in the study of conviction, persuasion and much of style, as presented by Whately; but four of them failed in the examination at the close of the thirteen weeks' course. The French classes, together, numbered sixty-seven, of whom seven left during the term and eight failed in final examination. The rest finished, in the course of eleven weeks, twenty-three lessons in Otto's French Grammar with daily written exercises upon the black-board.

The rhetorical exercises of the senior and junior classes have involved the usual expenditure of time and strength. The usual number of exercises have been prepared for presentation before the whole body of students on each alternate Wednesday afternoon, and the classes have met almost weekly for drill in elocution, analysis of themes, or description and narration. I have not at hand a complete memorandum of the number of exercises thus presented.

The junior class have had, as usual, a voluntary class in Shakespeare, meeting on Tuesday evening of each week. The number in attendance has averaged about thirty, a few members of other classes having been admitted by request. Three plays have been read with such comments as seemed needed to give understanding and interest, as well as some idea of the peculiarities of language and style.

Incidental labors in the College have included committee work, somewhat

greater than usual from the increased number of admissions during the year; one regular Wednesday lecture and another by proxy; one sermon at Sunday afternoon exercises; a weekly Bible class for the College Christian Union; and various items of special reference in the College routine. In the whole year I have been detained from College duties two days by a temporary illness.

During the winter vacation, beside taking the parts assigned me in the Institutes at Marshall and Saginaw City, as published in the Report of the State Board of Agriculture for 1877, I gave four evening lectures at different places in the State. I have also preached twice away from the College. All invitations to similar work during term time it has been absolutely necessary to decline.

In reviewing the year, I find myself unsatisfied with the work accomplished, because of too many and conflicting duties. Opportunity for much needed study in my own department I have been almost utterly without. During two of the terms my actual occupation in the class-room has averaged more than four hours a day, and at least another hour each day has been given to direction of students outside of classes. To this confinement has been added the ceaseless round of essays and orations for correction and the necessary correspondence of a librarian. If at any time duties in class-room have been less burdensome, as during the first six weeks of the spring term, an accumulation of work in the library has demanded attention quite as constant. The chief cause of my dissatisfaction with such an overburden of many kinds of work is its necessary imperfections. I ask the earnest attention of yourself and the Board of Agriculture to these disadvantages under which the department of English Literature is left to suffer. The absolutely necessary preparation for class-room lectures is hurried and often interrupted; the work for my own rhetorical classes is not planned or executed to my satisfaction, while several rhetorical classes are crowded upon others to whom neither taste nor inclination nor usual study makes them agreeable.

I ask that provision be made as soon as possible for the oversight of the library and the teaching of French, leaving to my charge the Rhetoric and English Literature of the course with all the rhetorical exercises of all the classes, and, for the present, the Moral Philosophy and Political Economy. With the present number of students, this would be not too burdensome, and it certainly would be far less distracting and unsatisfactory. It would give an average of about three hours a day in classes with abundance of desk-work; but the confusion would be less and the more natural concentration of thought would aid essentially in accomplishment.

Hoping that another year may give to the College such addition of men and means as to make this change possible, I respectfully submit this report.

GEO. T. FAIRCHILD.

REPORT OF THE LIBRARIAN.

To the President of the College:

The following report of condition, care, and oversight of the College Library covers the period of eleven months from October 1st, 1877, to August 31st, 1878. This slightly affects the figures in accounts of donations, books drawn,

and labor in care of the room, etc., to prevent their giving a fair average of current years.

The hours of daily opening have been the same as heretofore, from 4 to 6 P. M. on week days, and from 10 to 12 A. M. on Sunday. During the short vacations, when many students remain at the college, access to the library has been given for one hour after supper. The new rules for care and use of the library, adopted by the Faculty this present year, make no material changes in the management. In the regular routine of work four different students, two Seniors and two Freshmen, have been engaged; all have rendered good service. This duty has included: first, care of periodicals, stitching, cutting, arranging in places on racks and tables, and careful filing away each month; second, care of books, cataloguing and labeling of new ones, arranging on shelves, oversight of drawing, giving information to those consulting, and keeping accounts with each person using the Library; third, general care of the room, sweeping, dusting, warming, lighting, and opening and closing punctually at stated times. In this work there has been little to complain of, though my personal attention has been very limited. It has required 673½ hours' work at ten cents an hour.

During the spring term, work out of the regular routine employed two Seniors three hours a day, making 330 hours' work at ten cents. To this I gave almost constant supervision for six weeks, and daily direction afterward. This work involved: 1. Sorting, classifying and stitching into cases, several hundred valuable pamphlets, with a card catalogue for them, and a table of contents for each case. 2. Rearranging and recataloguing of some 500 volumes of United States Documents. 3. Filling a descriptive list of books, giving author, title, volumes, size, pages, editor, date, publishers, binding, purchase, or donor. 4. Perfecting files of newspapers for preservation or binding, and stitching incomplete volumes of old magazines for use without binding. 5. Separation of duplicates from other books, with a complete list of them and their location. 6. Introduction of more than 300 new volumes, with full catalogue and description. 7. Impressing every one of nearly 5,000 volumes with the seal of the Library. More of such work is still needed, but my time has been too full to give it the necessary oversight. A fuller catalogue of the contents of books would be especially useful, and ought to be begun before the extent of the task becomes an inseparable barrier.

The library has been more than usually attractive this year from the frequent additions received, and the increased number of periodicals. The average daily attendance for the greater part of the two hours during which it is open is reported to be above twenty. Of books consulted in the library we have no record, but those taken away number 1665, of which 103 were upon purely scientific subjects, and 189 pertained to agriculture, horticulture and other arts. Of course in the daily consultation of books, the sciences play a more prominent part. No noticeable losses have occurred, and no serious damages have been discovered.

The general inventory gives nearly 5,000 volumes of all sorts and sizes, valued at a trifle over $10,000. Of these nearly six hundred volumes are duplicates, and six hundred more are pamphlets of greater or less value, leaving about 3,750 bound volumes for the working library. These are distributed under various classes in round numbers as follows:

History, Biography, Travels, etc.	350
Philosophy, Criticism, Religion, etc.	275

Poetry and Fiction	200
Miscellany, Reviews, etc.	200
Cyclopædias and General Hand Books	125
Natural Sciences	650
Agriculture	750
Horticulture	245
Engineering and Arts	200
United States Documents, Executive	450
Michigan Documents	300

In addition to these there are files of newspapers from various parts of the State, preserved for several years, among which is the Detroit Daily Post and Tribune. Nearly complete files have been preserved for more than twenty years of the Michigan Argus, the Wolverine Citizen, and the Lansing Republican. These are not, however, bound for ready reference.

The current periodicals regularly supplied have numbered ninety-seven, of which seventy (see list of donations), have been furnished free of charge. Twenty-seven, all of which are of permanent value, and are bound at the close of the year, are taken by subscription:

Country Gentleman.
American Agriculturist.
Agricultural Gazette.
Gardeners' Chronicle.
The Garden.
American Chemist.
Chemical News.
Journal of Chemical Society.
American Journal of Science.
Popular Science Review.
Quarterly Journal of Science.
American Naturalist.
Nature.
American Bee Journal.
Eclectic Engineering Magazine.
Engineering.
Atlantic Monthly.
Harper's Monthly Magazine.
The Nation.
North American Review.
International Review.
Blackwood's Magazine.
British Quarterly Review.
London Quarterly Review.
Westminster Review.
Edinburgh Review.
Detroit Daily Post and Tribune.

All are taken by recommendation of the Faculty.

Other additions to the library have been 306 volumes by purchase, under sanction of the Faculty, and 182 volumes by donation, 85 of which are pamphlets.

I should mention, doubtless, in this connection, the library of the College

Christian Union, numbering over 300 volumes, and that of the Natural History Society, numbering over 100 volumes, all of which are deposited in the same room with the College library, and are in constant use under the same rules.

For the general account of the library, I may refer to the financial report of the Secretary of the College; but a classified summary of expenditures is in place here:

Books for Library	$647 82
Periodicals	124 99
Binding	60 63
Freight	19 32
Postage	8 71
Furniture	6 31
Stationery, blanks, etc.	9 58
Books to be re-sold	109 49

Of the total, $981.84, there is charged to the Library Appropriation Fund $830.21, and to current expenses $151.63. To offset this last amount there are receipts from special examination fees, $45.00, and cash receipts paid over to the Secretary, amounting to $118.89, and classified as follows:

From books by special order	$112 07
" duplicates, etc.	6 82

The fund for increase of the Library stands at this date, Aug. 31st, as follows:

Balance of State appropriation	$110 78
Balance from cash receipts, etc.	12 26
Total	$123 04

Against this is a bill soon to be rendered for a large job of binding not yet completed; this will reduce the balance to a very small sum.

The wants of the Library are essentially constant so far as books are concerned. The appropriation for the past two years of one thousand dollars for books has been economically used, and yet has not met the growing want. Certainly as much is needed for the next two years. At least $200 a year is needed for periodicals and binding. Means for continuing and extending the catalogue will involve slight expenditures for stationery, perhaps fifteen dollars. Other incidental expenses in postage, exchange, etc., should not exceed ten dollars a year. Furniture may remain essentially as it is for the next two years; but if possible, matting should be laid over the most frequented parts of the floor, and new stove-pipe and zinc are needed immediately.

I close this report with the earnest hope that more attention from some competent person can be given to the care and growth and use of this most important adjunct to the college instruction, and respectfully submit the whole.

GEO. T. FAIRCHILD.

REPORT OF THE PROFESSOR OF ZOOLOGY AND ENTOMOLOGY, CURATOR OF THE GENERAL MUSEUM, AND SUPERINTENDENT OF THE APIARY.

To the President of the College :

I submit the following report of my department for the past College year:

INSTRUCTION.

I had under my charge, during the fall term of 1877, the Sophomore class in Mechanics, and the Junior class in comparative and human anatomy. The first class numbered thirty-six, and passed over the subjects embraced under the head of mechanics, by use of text book. The second class were taught by lectures, and pursued the study for only six weeks. The class numbered thirty.

In the spring term of 1878, I gave instruction to the Seniors in physiology, and the Freshmen in book-keeping. The course in physiology lasted the fall term. The instruction was given by lectures, and by use of the text book. Numerous dissections added to the interest and profit of this study. The class numbered thirty. The class in book-keeping numbered ninety-six. The study was pursued for six weeks, in which time both single and double entry was considered. Instruction was given principally by lectures, while for practice the examples gived in Mayhew's text-book were written out.

During the summer term, the Senior class for six weeks pursued the study of zoölogy, and for the remaining seven weeks the study of geology. The class numbered thirty. The Junior class have also taken the usual course in entomology. There were thirty-two in the class. The instruction during this term has been both by lectures, and by use of the text-books.

MUSEUM.

During the past year we have received a large increase of specimens to the General Museum. Some by purchase, many by donation. Principal among the donations were the fine suits of specimens from Dr. Rominger of the State Geological Survey, and another from President Orton of the Ohio Survey. The fine Isler Collection, consisting of nearly two thousand specimens, many of them very excellent, has been specially valuable in illustrating the facts of geology. A magnificent collection of geodes from Keokuk, Iowa, presented by an alumnus of the College, Mr. O. Clute, forms a substantial addition to the usefulness and attractiveness of the museum.

Owing to the large accumulation of specimens, it was found necessary to enlarge the capacity of the museum. This was done by constructing a large case in the centre of the room. This required the rearrangement of the entire museum, which with the labeling, numbering, and recording of new specimens has involved much labor.

The new case so darkens the room, as to interfere, somewhat with the display, and emphasizes the importance of new quarters at no distant day. Room for display of specimens cannot be found, for a much longer period, in the

apartment now occupied. My recitation room, is already inadequate, and must of necessity be converted into a laboratory, for which purpose it is wholly unsuitable. A work-room beside the laboratory is indispensable, and all of these must be near the general museum. In arranging for the future, I hope and trust that all of the above points may be duly considered.

The following is classified a list of the specimens on exhibition in the general museum:

Mammals—stuffed specimens	48
Birds	270
Turtles	11
Lizards	15
Snakes	34
Fish	163
Batrachians—toads, frogs, etc.	35
Skeletons—vertebrate	5
Incomplete skeletons	126
Eggs of birds	270
" other vertebrates	15
Insects—economic collection	101
" one of each genus	592
" fauna of Michigan	1,153
Crustacea	32
Worms	27
Cephalopods	2
Cephalopods—shells	2
Gasteropods	5
" —shells	685
Lamellibranchs	10
" —shells	810
Brachiopods—recent	3
Tunicates	5
Echinoderms	80
Corals	40
Sponges	15
Rhizopods	5
Rocks	463
Fossils	821
Minerals	425
Indian relics	228
Vegetable products, woods, etc.	70
Insects not on exhibition	1,000
Miscellaneous	500
Total	8,066

THE APIARY.

The winter of 1877 and '78 was very favorable for wintering bees. Our bees in the cellar and those packed in straw (see Report for 1877) all wintered well. Those left unprotected did just about as well. From the mild winter this was

to be expected. Of the colonies buried, five were entirely beneath the surface level of the earth, while the other two were set above, and all covered with two layers each of straw and earth alternating with each other. The five wintered perfectly, the two colonies above died. This indicates as we should expect, that burying beneath the surface level is very desirable, as a uniform temperature is thus maintained. All of my experiments go to show that there is no method so safe and cheap, as that of burying, if all the requirements are fulfilled.

In one of our colonies the mice took up their abode. I became aware of this early in the winter, but suffered them to remain, that I might know by direct experiment, how grievous a pest they might become. The experiment was a signal success, as the bees were worried to death, the comb so mutilated as to be worthless, and the hive made the abode of intolerable filth. It is conclusively proved that mice should never be permitted to enter the hives in winter. Tacking a piece of perforated tin over the openings of hives buried or wintered in the cellars will effect this. If the hives are to remain on their summer stands, either with or without packing, the tin should not reach nearer than three-sixteenths of an inch of the bottom, so that the bees may pass in and out.

Not having skilled assistants to aid me in caring for the bees, and having to depend solely on students' labor, which can be commanded but for five days in the week, and then only three hours each afternoon, it was thought best to sell part of the colonies in the spring. Seventeen of the twenty-four were sold. The seven remaining we have increased to fifteen.

NEW IMPLEMENTS.

Among the donations to the College Apiary which we have tried the following are worthy of commendation: Bingham's, and the Quinby Smoker. These are both excellent. For a time there seemed little choice; but after three months' use, the Bingham showed a marked superiority. The Doolittle hive was also among the donations. In my opinion there is none better. The King and Shuck feeders are admirable. The Everette Extractor is a fine machine.

FOUNDATION.

We have used this another year, and are free to say that no Apiarist can afford to be without it.

BEE PLANTS.

Our beds of bee plants have been a source of interest and attraction to many, and have been closely studied by the students as well as by visitors. We have been especially pleased with the mustards, catnip, and motherwort. They seem to secrete honey at all times and to be favorites with the bees. Cleome, which may be made to bloom from the last of July till frost, is not only very beautiful, but is a very excellent honey plant. I have decided that a cheap way to practice stimulative feeding is to cultivate a few plants that will bloom in the intervals of the usual bloom. The mustards, rape, mignonette, and cleome seem admirably adapted for this purpose.

We have experimented with a large number of foreign plants, none of which have given much promise, though some of them come to us highly recommended. One season's results are hardly a fair test of their value.

The following are the plants grown on our experimental plats:

Sinapis nigra—black mustard.—Excellent; blooms from 8 to 10 weeks after sowing.

Sinapis alba—white mustard.—Excellent; blooms from 4 to 5 weeks after sowing.

Brassica rapæ—Rape.—Excellent; blooms from 4 to 5 weeks after sowing.

Nepeta cataria—Catnip.—Excellent; blooms in July and August.

Leonurus cardiaca—Motherwort.—Very excellent; blooms in July.

Borago officinalis—Borage.—Blooms from July to frost.

Onobrychis sativa—Sainfoin.—Blooms in June.

Medicago lupulina—Yellow trefoil.—Blooms in June.

Trifolium repens—White clover.—Very excellent; blooms in June.

Trifolium hybridum—Alsike clover.—Very excellent; blooms in June.

Medicago sativa—Lucerne or alfalfa.—Blooms in June.

Melilotus alba—Sweet clover.—Very excellent; blooms in June and July.

Dipsacus fullonum—Teasel.—No bloom; a biennial.

Cleome integrefolia—Cleome.—Very excellent; in bloom from July to frost.

Hibiscus esculentus—In bloom in August.

The following twenty-five species were from seeds received from Austria. They were sent us by Herr Rudolf Maherhöffer, editor of "Der Bienenvater aus Bömen," who spoke of the first-named as very celebrated in Hungary:

Stachys onna, in bloom all summer.

Erysimum asperum—wall flower.

Chloni barbata—did not bloom.

Asclepia seriaca—did not grow.

Scabiosa nana.

Prenpinella anisum.

Bartonia aurea.

Fœniculum vulgare—Fennel.

Ocimum Basilicum—Sweet basil.

Portulaca hybrida.

Clarkia pulchella—did not grow.

Cuphea purpurea.

Silene pendula.

Placelia congesta.

Thymus vulgaris—thyme—visited by bees.

Cozophora lateritia—did not grow.

Whellavia grandiflora.

Aspersela azurea.

Enchoedium concinnum.

Cynoglossum lenifolium.

Mex Europens.

Eutoca viscida.

Chaceta lanacetifolia—visited by bees.

Bemias orientale—did not bloom.

Omi strobus.

I have procured an imported queen, and have destroyed all black and hybrid queens, resolving in future to keep only the best. The superiority of the Italian needs no further proof.

CHARACTER OF THE SEASON.

Owing to the frequent spring rains, the yield from the fruit blossoms, white clover, and basswood was very light. So far the yield from fall flowers is good, and the promise from this source is encouraging.

ENTOMOLOGICAL EXPERIMENTS.

During the season I have experimented, so far as my already crowded time would permit, that I might learn new and improved methods to destroy some of our worst injurious insects. I have carefully observed the Hessian fly, have studied its structure, habits, and transformations, and have embodied the results in a paper to be found in the Report of the State Board of Agriculture for 1877. I have this insect still under consideration.

In April and May I cut each day a square of wheat one rod each way. All of that cut after the wheat had jointed was entirely ruined. Nor was any of it preserved from attack by this cutting. This season the second brood of maggots worked just at the ground, and could not be much disturbed either by feeding or cutting. Usually these maggots work more at the second and third joints, in which case cutting or feeding would do good service. I think the frequent and copious rains which occurred last spring, all during the time when the fly was depositing eggs, was the cause of this change of habits.

THE CODLING MOTH.

I have in my orchard two trees of the Siberian crab apple, which are less than two rods apart. One of these I sprinkled once each week, from May 20th to June 20th, with a strong solution of common soft soap. I say common, it was hardly common; it smelt so that we could not keep it in the cellar. As a result of this,—I can see no other reason,—there is not a wormy apple on the tree, while the other tree has very many that are wormy. The tree that I treated has on it much the most fruit. I found in sprinkling this tree, and others under experiment, that we had a very valuable auxiliary in Whitman's fountain pump, manufactured by J. A. Whitman, Providence, R. I., and sold for $7.50.

CABBAGE BUTTERFLY.

I have found that a strong solution of whale oil soap, one-eight of a pound to each gallon of water, will aid in keeping the cabbages free of the cabbage worm. A weak solution of carbolic acid will have the same effect, but is objectionable, as the odor on the cabbage prevents easy sale. This solution should be applied early in the spring,—as soon as the cabbages are set out, again in July, and also early in September. For applying a liquid to such plants as cabbages and potatoes, Lewis' syringe is admirable. The fountain pump will not work if pointed much below a horizontal direction. The cabbage butterfly is much less abundant this year than last in many parts of the State. This may be owing in part to the fact of the warm spring, which brought the insects before their food was in readiness, and so caused many to perish. Mr. H. Hampton, one of our graduates, writes me that he has discovered several parasites at work on the larvæ and chrysalids. These ever vigilant friends may solve this difficulty for us in a very acceptable manner.

LEAF ROLLERS.

Last season a bitter-nut tree, Carya amara, near my house, was seriously injured by the walnut leaf-roller, Phycita juglandis, Le Baron. This season two trees were attacked equally bad. With my fountain pump, I sprinkled one of these trees, using a pailful of water,—about two gallons,—in which was mixed a teaspoonful of Paris green. This tree was wholly freed of the evil, while the other tree suffered greatly.

ANSWERING INQUIRIES.

The past year has been no exception to the previous ones in the number of inquiries which I have received pertaining to matters in my department. Often I receive five or six such letters by a single mail. Such letters I have always answered promptly, but this adds very greatly to my labors. I think this work should be continued, but if it continues to increase I can only perform it by being relieved of other work. It seems to me that all teaching which I do outside my department, which has really scope for three professors, is a positive injury to the College.

LECTURES AND PAPERS.

During the year I sent an elaborate paper, on marketing honey, to be read before the National Bee-Keepers' Association. This was afterwards published in a pamphlet. I also gave a lecture on the Phylloxera Vastatrix before the Ohio Horticultural Society, one on the same topic before the Michigan Pomological Society. These lectures appear in the published reports of the above named societies. At the Allegan meeting of the Michigan Pomological Society, I spoke on the leaf-rollers and the codling moth. I gave during our winter vacation a course of ten lectures before the Michigan Female Seminary at Kalamazoo, on Zoölogy. I attended and lectured before three institutes: the Paw Paw, Saginaw, and Climax, and gave assistance to the very competent local committee in the preparation for the Saginaw Institute. In May last I spent some time, at the solicitation of Hon. Wm. L. Webber of the Flint and Pere Marquette Railroad, in investigating the destructive pine-borers of our Michigan pine forests. I prepared a fully illustrated article on the subject, which was published in full in the Detroit Post and Tribune, Free Press, and Lumberman's Gazette, and extensively copied in others of our State papers.

MANUAL OF THE APIARY.

The first edition of 3,000 copies of this work, issued two years ago, having been exhausted, I have re-written, enlarged and copiously illustrated a second edition which has been published by T. G. Newman & Son, of Chicago.

The second 1,000 copies of the revised edition has already been issued, and the third 1,000 is being issued, though the work was not published till June, 1878.

I have been Superintendent of the College Sabbath School for the entire year.

A. J. COOK.

AGRICULTURAL COLLEGE,
Lansing, Mich., Aug. 31, 1878.

REPORT OF THE PROFESSOR OF BOTANY AND HORTICULTURE.

To the President of the State Agricultural College:

During no year since I have been connected with the College, has the time in my department been so uninterruptedly filled with hard work as during the year which has just closed. My health has been good, my classes large and numerous. The plans for work of the students and for experiments have demanded more time than I could command. Notwithstanding all these, I believe the work of no year has given greater satisfaction to teacher and students, foreman and gardener.

BOTANY.

The names enrolled in the class of Freshmen and special students were one hundred and twelve. During the first six weeks, I met the class daily in two divisions; during the next term of thirteen weeks, in three divisions. The inductive method of teaching has been quite rigidly adhered to, and I believe with very gratifying results. The students appeared much interested and made excellent progress.

I think they spent more hours on their lessons, with more willingness and with much better results than they would if they had begun with the book with only occasional references to specimens for illustration. For the encouragement of those who have not tried this method, I may say it is the easier method of the two for the teacher.

The first two weeks were spent in the examination and comparison of the small limbs of eight species of trees before the leaves had appeared. This examination was made during the usual time for preparing lessons, and not in the class room. The hour with the teacher was given to a report of the observations of the students, the specimens being out of sight. In a few instances each student wrote out a careful description of what he had seen. In a similar manner all other parts of plants were taken up and specimens studied. The reports of their observations were credited according to merit as is usually done for reciting lessons learned from books. The students were not told about things which they could see for themselves.

An effort was made to keep them working after something which they had not discovered. Quite often members of the class disagreed in their views of the same objects. On the next day they were required to bring in all the proofs they could for their belief.

They often made experiments on growing seeds and plants. There was generally time enough, though not always, to get all the different or new points which each member of the class had to present.

It is astonishing to notice how much is discovered by so many good eyes, yet it is sometimes equally surprising to see that some simple prominent points are overlooked by all.

For some weeks but little use was made of microscopes or text-books. In nearly all cases,—in all important cases,—specimens were examined, and a need was felt for definitions and names before these were given.

After a while a few hints were given, such as the following: It is often of importance to count the parts, to examine several similar specimens of the

same species, to examine specimens of all ages or stages of development, to observe the relative size of parts, to observe their relative order, to compare the organs of one plant with those of a similar nature found in other species or orders of plants. Gradually the microscope was employed, and finally a review was made by using a text-book.

QUESTIONS IN BOTANY.

First examination after studying six weeks.

1. How does the flower before you (lilac or phlox) differ from the pattern flower?
2. In what respect is it like the pattern flower?
3. Define monœcious, diæcious, perfect, neutral, irregular, and give an example of each?
4. Define adhesion, cohesion, free, distinct, umbel, and give examples?
5. Name the parts of a complete leaf. Define placenta, as parietal, axile, free, central; a cyme, spike with examples?

Second examination after thirteen weeks.

1. What is systematic botany? species? genus?
2. What is the difference between a root and a stem?
3. What is the morphology of a rose-hip? a strawberry?
4. What is a rotate carolla? salver-shaped, with examples?
5. What is a pappus, and what is a coma? Give examples?
6. Give the morphology of an anther, as innate, adnate, kidney-shaped, versatile?
7. Draw and describe all the parts of an anatropous seed with endosperm? Is there any rule, if so, what is it, for the position of the radicle?
8. Give the morphology of a drupe, a legume, a pine-cone, a fig?
9. What is the plan of a flowering plant?
10. What is the morphology of a tuber, a bulb, a corm, with an example of each?
11. What is circinate? convolute? quincuncially imbricated? equitant?
12. State how to number the scales on a cone, find its phyllotaxy and the series to which it belongs?
13. What is a connate perfoliate leaf? give an example with its marphology and the reasons for your belief?
14. Draw a leaf which is stipulate, petiolate, ovate, acute, cordate, and crenate.
15. Why do we say that bud scales and scales of rhizomes represent leaves?
16. What is the morphology of a spine?
17. Explain how epilobium or willow herb is fertilized? also lobelia, and figwort or scrophularia? what is protandrous and the object of it?
18. Explain how a young vine behaves, how drosera rotundifolia catches flies, how small algæ move?
19. Write out a table giving classification of the plant kingdom down to and including class?
20. Define an asplenium? aspidum? polypodiaceæ?

LANDSCAPE GARDENING.

The usual time, half a term daily, was devoted to the above subject by the members of the last Senior class. The instruction was by text-book and lectures, with many references and some visits to numerous parts of the College

grounds. The illustrations were especially valuable in the subjects of grading, paths, drives, varieties of trees and their arrangement.

EXAMINATION QUESTIONS.

Time, an hour and a half for writing answers.

1. Name ten prominent points in the choice of a place.
2. What is the best site and aspect for a house?
3. Where is the proper place for a shelter of trees, and what are the best kinds for this purpose?
4. Name thirteen of the points given by Kemp on what to avoid.
5. Explain intricacy and tell how it is obtained.
6. What is gradation?
7. Tell how to increase the apparent extent of a place.
8. Give three rules for locating trees.
9. Name six best evergreens and six best deciduous trees for our climate.
10. Tell how to grade a lawn properly.
11. Tell where to place climbers and how to manage them.
12. Tell how to make a place gay; how to make it sombre.
13. Define the formal style.
14. Tell how to construct walks.
15. Define adaptation.
16. Name five requisites in economy.

INSTRUCTION IN HORTICULTURE.

During all the spring term of twelve weeks in 1878, I gave daily lectures on horticulture to the members of the Junior class. No use was made of text books.

The subjects were treated in as practical a manner as it was possible for me to present them. I began with market gardening and treated of selecting a place, fertilizers, compost heap, implements, hot-beds, transplanting, sowing seeds, tillage in its various departments. I gave some account of all the leading kinds of vegetables and small fruits, their classification, cultivation, improvement, etc.

Then followed an account of grapes and the various large fruits, their proper cultivation and management, including a short account of the latest and best methods known for fighting the various insect foes of the garden and orchard; also the bird question, and something about moles, mice, and stealing fruit.

Here followed some hints on taking notes, and making plans, hiring and overseeing help, the farmer's garden, judging at fairs, etc.

Several lectures were given in regard to experimenting, the difficulties, testing varieties, changing and improving seeds, "intercultural tillage," improving native and wild plants by cross breeding, importance of good breeding, which parent exerts most influence. One lecture only was devoted to the history and progress of horticulture. Then followed an account of cross and self-fertilization of flowers, modes of propagation. The above topics here named give a very meagre idea of all the subjects treated in the lectures.

In addition to the instruction in the class room, sections of the class have met me once a week for more extended practical instruction in operations which cannot be well taught in the class-room. During this instruction the students usually receive no pay for labor performed.

The topics taught in this way, with tools in hand, have been trimming of

apple trees, taking up and setting out plants, large and small, repairing walks and drives, several ways of grafting, crossing or hybridizing flowers, training grapes, budding, layering, care of hot beds, testing seeds, proper use of tools, and numerous other topics, best shown in the place where the objects are to be found. An attempt is made to give all some practice in what is looked upon as the most difficult and mysterious of horticultural operations.

In some of the most important of the above, all the students have more extended practice. About half the students of the Senior class have worked all the year in the Horticultural Department. Some of the most important part of the instruction is given separately to each of these young men while they are overseeing certain kinds of work. One Senior is set over some portion of the department for the whole year. One looks especially after the vineyard, one the apple orchard, one the orchard of pears, cherries, and plums, another the trees on the lawn, another the drives and paths, one the hot-beds, and a portion of the vegetable garden, one the wild garden, and testing seeds, one the experimental and sample beds of grasses, clovers, etc., another some portion of the vegetable garden. Whenever any work is done in each of these places a Senior is there to act as an assistant foreman in directing the labor of other students in the lower classes.

These young men take an interest each in his own work which he superintends the year through. They often work over time and at odd hours to finish up something which needs attention.

In addition to this oversight of work, most of these sub-foremen assist me in making experiments. Besides these, members of the Junior class are making experiments of their own accord on their own time. I will name a few experiments which I know some of my students are making of their own account in the Horticultural Department.

One is crossing the flowers of wheat for new varieties, one crosses wild and cultivated crab apples, two cross corn, two or three cross different sorts of lilacs, one observes the duration of flowers of several kinds, one crosses tomatoes, one observes the peculiarities in the germination of seeds, one monstrosities among flowers and plants, another layers apples, one studies parasitic plants, another tries to discover how nature sows wild oats, one studies the nodding of the heads of wheat, another the depth of the roots of barley and oats, another sows seeds and raises plants of clover, the parent plant of which bore many leaves which had four leaflets, another plants "buggy" peas and those not buggy for comparison, another digs up stools of chess to find the old kernels from which the plants grew.

QUESTIONS IN HORTICULTURE.

1. How would you select a good place for a garden?
2. How would you start and treat tomatoes from the seed?
3. How would you manage a compost heap?
4. State a good way to construct and manage a hot-bed.
5. State the chief difficulties in raising celery.
6. State how to set out and mulch strawberries.
7. Name the leading points used in classifying apples.
8. Give a short list of eight pears for Michigan.
9. What is the best soil for plums,—best stock? How can the curculio be successfully managed?
10. State some one good way of training grapes till the vines are five years old.

11. Give some of the best known points for overcoming the insects which infest cabbages.
12. Name the best known methods of overcoming the codling moth.
13. Give some rules for overseeing work.
14. Name the departments of horticulture and show its relation to agriculture.
15. Give some of the best points to be observed in saving seed corn.
16. Briefly state the practice and the results of Dr. Sturtevant's "intercultural tillage" of corn.
17. How shall we proceed to improve native fruits?
18. State how to select the parents and make crosses of plants.
19. Give the practical results of Darwin's "Self and Cross-Fertilization of Flowers."
20. Define a hybrid, a variety, a race, and give five examples of the last two.

HISTORY.

During the autumn term of 1877 I gave daily instruction in history to the members of the Freshman class. We used Swinton's Outlines of the World's History.

Although the class seemed interested in the study, I hope never to be called on to teach another class in this subject. I believe I am capable of doing something else which will be of greater benefit to the College and the State, while there are others who can teach the history better.

MUSEUM OF VEGETABLE PRODUCTS.

During the year I have added something by way of seeds to the museum. The additions consist chiefly of Indian corn and seeds of some wild plants. These are stored away in dark closets and boxes for want of a room in which to exhibit them. We have one of the best collections of corn I ever saw. It would be a matter of much interest to students and visitors if it was in condition to be examined.

At present the general museum, as it is called, the collection of animals of various kinds is visited by large numbers of people. A little effort would add to the collection of vegetable products, and a little more effort and means would place it on exhibition if we only had a suitable room for the purpose. In closing this paragraph, allow me to express a hope that the President will present the subject to the State Board of Agriculture and show them the urgent need of a room for a museum of vegetable products.

EXPERIMENTS.

At the early date of making my report, most of the experiments for 1878 are still incomplete. An account of the results will appear in a subsequent part of this volume in connection with the transactions of the farmer's institutes which are to be held in January, 1879. The report for 1877 was kept open long enough to include the account of experiments made in that year. I here make a very brief mention of most of the new experiments going on this year.

More experiments were made last year than were mentioned in the plan, which was presented to the State Board of Agriculture early in the spring of the same year. A good many of those have been continued during this year, and some of them will continue for some years to come.

We are trying by selection and cultivation to improve one variety of Indian corn, two of onions, one of beans, one of tomatoes, and one of wheat.

We have planted about seventy-five varieties of corn, over twenty of onions, and about 250 named varieties of potatoes, besides about as many more unnamed seedlings which have originated at the College.

We have pruned some limbs from two apple trees on the twenty-fifth day of each month in the year, to see which will thrive the best.

To the row of mulched trees (see previous report) we have added a small wagon load of old straw to each tree. On a row by the side of this we have spread broadcast to each tree a wagon load of leached ashes. Another row is well manured, but left in grass. We are bandaging all of our apple trees to catch the moth, and inducing our neighbors to do the same. We strip the fruit from some trees in full bearing to change the bearing year. We are sprinkling slaked lime on some trees and gypsum on others to observe the effect on the codling moth, leaves, fruit, etc. Numerous other experiments are going on in attempting to destroy the codling moths. We have added thirty varieties of the best apples from southern Ohio. We sent to southern Ohio for pollen of apple flowers to use here in making crosses. We layered one apple tree to get young trees of equal quality for future experiments. We continue the experiments with the trees in grass described year before last.

We have received, by purchase, forty-one new unnamed varieties of grapes from Haskell, of N. Y. We sent to Ohio for pollen of flowers of the grape, which was used in fertilizing some flowers at this place. We have set 300 of our seedling grapes between the 300 named sorts in the new vineyard.

To the arboretum we have added rows of seeds of blue ash, shag-bark hickory, Judas tree, yellow-wood, white-oak, scarlet-oak, white-wood, rock elm, and small quantities of other species of trees.

For experiment, we have planted pits of peaches diseased with the yellows.

We have small samples of hedges of honey locust, osage orange, pepperidge, wild crab-apple, wild plum, hawthorn, prickley ash; also, of arbor vitæ, Siberian arbor vitæ, Austrian pine, Norway spruce, lilac, spiræa, etc.

The arboretum contains a large variety of other seedlings. We grafted potatoes on tomatoes, and artichokes onto sunflowers; continued the planting of black-wax beans which were crossed with foreign stock, and shall compare them with those not so crossed; also continue to raise the corn last year crossed with foreign stock.

We have obtained Yellow Danver's onions, which have been raised for forty years by Gregory of Marblehead, also some of the same variety from Connecticut. We shall cross the flowers of these, also save some seeds of each pure for comparison of results.

We continue to raise some twenty varieties of Japan vegetables, such as ripened seeds last year. These consist of squashes, beans, cucumbers, onions, radishes, and lettuce.

We are testing ten or more of the best varieties of tomatoes, and have crossed the Conqueror (best of all last year), with a smooth early sort.

We have crossed the flowers of Clawson wheat with Diehl, and have root pruned these also.

We have crossed flowers of two varieties of gooseberries; also black cap raspberries with red raspberries.

We are root pruning dent corn and some other sorts to observe the effect on the yield. We are trying the same on tomatoes, turnips, cabbages, and perhaps we may do the same on other plants.

We intend to bury in bottles numerous kinds of seeds to dig up at remote intervals for testing their vitality.

We crossed dent corn with flint corn and the reverse.

We collected pollen of the flowers of apples and of strawberries to see if it will keep for use next year.

We are trying the feeding of tomatoes, petunias, and martynias on their leaves with soup.

We shall try to hybridize alsike, red and white clover.

We have selected stools of chess and find the old kernel from which the plants grew; also traced the depth of roots of barley and oats, and perhaps other plants.

We have purchased in a roundabout or indirect way a lot of vegetable seeds from several seedsmen and have purchased seeds of the same sorts which are sold at our groceries on commission. These we are testing with each other and with seeds of our own growing, as to their vitality, purity, etc. They are tried in the vegetable garden and in the greenhouse.

We have saved seeds of some old plants of red clover to try to establish a perennial variety.

We have crossed Duke and Morello cherries.

We are collecting several kinds of timber, intending to split the pieces, setting two side by side, one "top end" down, the other in the same position in which it grew.

We are testing forty varieties of new and promising named varieties of strawberries; we also have a fine lot of seedling strawberries, some of which have borne this year; also some seedling gooseberries, a few of which have borne this year for the first time.

Eight of our graduates are experimenting in different portions of this State under my direction. They have agreed to furnish for my report an account of their experiments.

Notwithstanding I have had three hours a day of teaching in the class-room, I planned a large number of experiments in horticulture. Most of those selected, like those of last year, require only a moderate expenditure of money, but a good deal of time and care. I have often wished that we had more means for this purpose. There is a pressing demand kept constantly in my view for more experiments. This comes from the highest talent in our State,—from leading officers and prominent members of our State Pomological Society, and from others who are alive to progress in everything which pertains to agriculture.

I think I have notes of enough experiments in my books to require all of my time and that of two good assistants for the next ten years.

I have been connected with the Agricultural College eight years, and Professor of Horticulture only six.

To those who are impatient for great results in experimenting, I may say that even with a large outlay of money (which we have not had for the purpose), ten years is by no means too distant as a final point; while at the world-renowned Rothamstead farm of Dr. J. B. Lawes in England "*twenty years is not considered too long a time to wait upon any experiment on field produce.*"

I look over all the leading agricultural papers printed in this country, and the best of those printed in England. The report of the experiments made in the horticultural department of Michigan Agricultural College has been extensively quoted, and during the past year especially, they have attracted more attention and favorable comments from the press than those made in any other State. It is encouraging to know that the College is able to make some experiments which attract attention and meet with approval.

As before mentioned, I have tried as hard as I could to make these experiments. Some have been neglected or incomplete for want of time. I have undertaken too much. In planning for the next two years this question of experimenting should soon be decided. My classes are growing larger and more numerous. There are more students to look after in the afternoon work. The teaching of three hours a day is in most good colleges a day's work for one man. It is not half of my work. With so many duties I shall not be able in the future to spend as much time in experimenting. Experiments require too much care to be entrusted to students who are inexperienced.

If the members of the Board think best, after understanding this matter, they can increase the value of experiments in the Horticultural Department in one of the following ways:

1st. They can give me an assistant to do some of the teaching.

2d. They can employ some one to teach history, which is not in my department.

3d. They can ask for a small amount of money to be used in conducting experiments. This would enable me to employ one or more of our best graduates to assist in experiments. He or they could assist in looking after some of the details of work in orchard, vineyards, etc. I hope this subject will soon receive the attention of the Board.

Owing to the rapid and unprecedented increase in the number of our students, it costs more to pay them for their labor. Mr. Cassidy, Mr. Gully and myself have often considered how we might make more of the labor of the Horticultural Department return money to the College. The improvements going on and the ordinary care of the grounds, have required all the labor we could command after deducting the labor required for the orchards and gardens. The extensive grounds still need, and will always need a good deal of labor which brings no return in money. Considering the extent of the grounds and the work accomplished, it has never, since I have been here, been so economically done as during the present summer. The mowing has nearly all been done with horse power, the drives have been kept clean and smooth with a scraper and plane run by a horse power.

With the propagating pits completed, we can raise and sell more plants and cut flowers. We are preparing to sell a large assortment of the best sorts of strawberries, corn, onions and potatoes, and perhaps some kinds of vegetable seeds.

We propose and have the consent of the Professor of Agriculture to use field number one (this side of the apple orchard) for garden purposes. This is better for vegetables than the piece this side of the lane. On the west side of the piece last named I purpose setting about 300 trees of late or sour cherries, also an acre of currants, and some gooseberries, and more raspberries. With the ground proposed we could seed down a portion each year and have some fresh sod ground for potatoes and such crops as need this treatment.

We also advise running a horse daily to town to carry the plants, flowers, and vegetables and berries. The same horse and driver can bring the mail. We can increase our stock of small ornamental trees, evergreens, shrubbery, and perennial herbs, and all will make work for students and the rest of us too.

To help in this undertaking, and to perfect the grading of grounds and keep them in better condition, we need at least another two-horse team for the whole year, or for eight months in the year.

THE APPLE ORCHARD.

It is not my intention to repeat what was stated last year or the year before in reference to the plans and experiments in the orchard. In spring we added the following varieties which were grafted in the tops of trees of the Northern Spy. These varieties were selected by Dr. J. A. Warder of Southern Ohio, and in his estimation were the most worthy of trial at this place. The following are the names, with the exception of four which were without names:

Ohio Nonpareil, Nick-a-jack, Kentucky Longstem, New York Spice, Griffith, Indiana Favorite, Minor's Greening, Roman Stem, Downie, Smith's Cider, Harvest Red Streak, Menagere, Grime's Golden, Early Pennock, Carter's (N. C.), Jeffries, Fall Queen, Culp, Fink, Clyde Beauty, Bethlemite, Phillip's Sweet, Fulton, Housum, Doctor Watson, Hoadley, Kirkbridge, Ashmore, Bonum, Canada, Reinette.

Most of the orchard is now well tiled, and the trees are looking well and many of them bearing full. The severe frost in spring cut off some varieties entirely and thinned many others. Some of the fruit which remained on the tree was injured and rendered imperfect. Some time has been given to thinning out the poorest fruit, especially where the trees were well filled.

Late last fall the orchard was plowed except certain rows. Since then it has been harrowed and cultivated till the fourth of July. Buckwheat and weeds have since occupied the ground. Late culture was discontinued for fear of inducing a late growth. Most of the land is now seeded to red clover which will probably remain through all of next year, when it will be plowed under. The trees received a light pruning as usual. The barnyard manure, the mulch, the ashes, the cultivation, and above all, the thorough drainage are showing their good effects in the improved appearance of the trees, and in the quantity and quality of the fruit produced.

An account of the experiments in the apple orchard must be omitted for the last part of this volume.

PEARS, PLUMS, CHERRIES, AND PEACHES.

The trees in this young orchard are generally doing well. They are set on the highest land on the farm, and on the only land which is composed of clay.

As this is the only suitable spot on the farm for such an orchard, and as it is somewhat limited in area, we can never have very extensive orchards of these fruits. The severity of our climate is also a serious hindrance in these departments of pomology. The hill is well drained. The land was cultivated until about the tenth of July, after which nothing was done except to mow the grass and dig the larger weeds. The trees are growing fast enough. The trunks of the pear trees have been washed with a lime whitewash containing sulphur, carbolic acid and a very little lampblack. The first three ingredients are those used and recommended by Mr. Saunders of Washington to prevent blight. The lampblack was to prevent or tone down the glaring white and produce a mild gray color. Early cherries are of scarcely any value in this locality on account of the large number of birds which flock to the College grounds. We shall plant in the new garden about 300 late cherries, this fall or next spring.

I name the varieties represented in the orchard on the hill:

The pears are represented as follows: Bartlett, Belle Lucrative, Beurré Bose, Beurré d'Anjou, Beurré Gifford, Beurré Hardy, Beurré Gris de Hiver, Bloodgood, Brandywine, Buffum, Beurré Superfine, Clapp's Favorite, Doyenné

Boussock, Doyenné d'Ete, Flemish Beauty, Grey Doyenné, Howell, Louise Bonne of Jersey, Lawrence, Louise Bonne, Madeleine, Napoleon, Onondaga, Osband's Summer, Kostiezer, Seckel, Sheldon, Tyson, Urbaniste, Winter Nélis, White Doyenné. There are also some young seedlings.

There are also the following plum trees: Lombard, Jefferson, Washington, Wild Goose, Smith's Orleans, and some seedlings.

The following cherries are represented: American Heart, Belle de Choisy, Governor Wood, Carnation, Kentish Red, English Morello, May Duke, Reine Hortense, Yellow Spanish. There are also a large number of seedlings.

PEACHES.

We have a few trees in square boxes which we set in a cellar during winter. In summer the boxes are set in the ground. There are also a few trees which are trimmed low, and partially covered with rails, litter, etc., during winter. We shall set a few others in the most favored spots.

For other experiments on protecting peach trees by corn fodder, etc., see the reports of previous years.

THE VINEYARDS.

The vineyard on the terrace by the green house has been filled this spring by adding forty-one varieties of Haskell's new seedlings. The spring frost killed back all the vines and prevented their fruiting except in a few cases. The vines are all doing well. These are trained to one slanting stem which slopes very gradually to the east. They are trimmed in autumn and then buried with a few inches of earth, which remains undisturbed till early in May. On the hill northeast of the President's house has been planted a vineyard of 300 vines twelve by twelve feet. Thirty of these are Hartford Prolific, seventy Agawam, and two hundred Concord. Between these have been set 300 College seedlings. Besides the seedlings and the new sorts from Haskell we now have the following thirty-six named varieties, viz., Arnold, Alvey, Agawam, Barry, Brant, Brighton, Blackhawk, Clinton, Concord, Cottage, Creveling, Delaware, Delaware Seedling, Ives' Seedling, Isabella, Iona, Hartford Prolific, Martha, Lady, Norton's Virgina, Owosso, Perkins, Senasqua, Rogers 3, Merrimack, Rogers 5, Rogers 1, Rogers 44, Rogers 9, Rogers 39, Taylor's bullet, Talman, Telegraph, Wilder, Worden, Walter.

SMALL FRUITS.

The raspberries and blackberries have been removed to the new garden north of the farm house. They have made a good growth. The currants and gooseberries have done well, excepting some damage done by the frost We are preparing to set an acre or more in the new garden. The strawberries were only about half a crop on account of the severe late frost. We have set our plants for raising plants and for testing varieties as follows: They are set in blocks three by three feet and each block six feet from contiguous blocks.

We have the following named varieties: America, Agriculturist, Afrique, Belle, Black defiance, Cummings' Seedling, Carolina, Champion, Charles Downing, Colonel Cheeny, Captain Jack, Cumberland Triomphe, Duncan, Downer's Emperor, Essex Beauty, Excelsior, Forest Rose, Glendale, Great American, General Sherman, Great Prolific, Green Prolific, Grace, Hervey Davis, Jucunda, Kentucky, Metcalf, Monarch of the West, Matilda, President Lincoln, Pioneer, Rappahannock, Russel's Advance, Russell, Starr, Seneca

Chief, Seth Boyden, Sterling, Seneca Queen, Seneca Chief, Triomphe. Besides these there are several hundred varieties which we have originated by using Hathaway and Wilson or Monarch of the West and Wilson as the parents. Some of these bore fruit the past summer. Four plants of each of the most promising have been set for further trial.

I should have said that we have some six or seven hundred seedling raspberries and several hundred seedling gooseberries and a large number of seedling currants.

BEDS OF GRASSES, JAPANESE VEGETABLES, ETC.

For report of these see last part of this volume.

TESTING SEEDS.

The striking results reached in testing seeds last year encouraged me to continue the work this spring. I purchased in Lansing and in Battle Creek seeds of the following vegetables. These were sold on commission at the groceries. They were tested about the same as last year in the greenhouse, in folds of thick paper kept damp and at nearly an even temperature of 60 degrees. We have found no other way by which so large a proportion of seeds will germinate. In nearly every case the variety of any vegetable was the same, no matter by what firm it was sent out. For example, all the papers of beets were labeled "Blood Beet," all onions "Yellow Danvers," all squashes "Hubbard."

Detroit Seed Company.

	Seeds Planted.	Seeds Germinated.	Per Cent.
Carrot	50+50	42+40	82
Lettuce	50+50	43+43	86
Cabbage	50+50	28+31	59
Parsnip	50+50	19+14	33
Cucumber	25+25	23+20	86
Squash	10+10	9+ 8	85
Turnip	50+50	48+49	97
Tomato	50+50	41+44	85
Salsify	25+25	25+24	98
Onion	50+50	34+36	70
Radish	25+25	22+20	84
Peas	25+25	21+20	82
Corn	25+25	18+14	64
Beans	25+25	20+19	78
Beets	25+25 pieces	19+23	84

Briggs & Brothers, Rochester, N. Y.

	Seeds Planted.	Seeds Germinated.	Per Cent.
Carrot	50+50	16+18	34
Lettuce	50+50	44+41	85
Cabbage	50+50	34+36	70
Parsnip	50+50	28+26	54
Cucumber	50+50	46+48	94
Squash	25+25	21+20	82
Turnip	50+50	27+31	58
Tomato	50+50	43+37	80
Salsify	25+25	14+18	64
Onion	50+50	40+37	77
Radish	50+50	29+34	63
Corn	25+25	Destroyed.	
Beans	25+25	23+24	94
Beets	25+25 pieces	13+14	54
Cauliflower	50+50	42+44	86
Turnip	50+50	43+45	88
Squash	12+12	11+10	87

D. M. Ferry & Co., Detroit.

	Seeds Planted.		Seeds Germinated.	Per Cent.
Onion—Red Wethersfield	50+50		38+41	79
" Yellow Danver's	50+50		26+39	65
Carrot	50+50		38+44	82

Lyman Seed Co.

Lettuce	50+50		11+15	26
Cabbage	30+30		9+21	50
Parsnip	25+25		18+19	74
Cucumber	25+25		20+20	80
Squash	12+12		11+11	91
Turnip	50+50		45+43	88
Tomato	50+50		38+40	78
Salsify	50+50		4+ 9	13
Onion	50+50		19+24	43
Radish	50+50		38+41	79
Peas	25+25		24+25	98
Corn	25+25		19+23	84
Beans	25+25		23+24	94
Beets	25+25	pieces	23+21	88

Shaker Seed Co., Lebanon, N. Y.

Cabbage	50+50		41+47	88
Squash	12+12		12+12	100
Onion	50+50		47+43	90
Radish	50+50		38+39	77
Beets	25+25	pieces	23+23	96

College Seed.

Cabbage	50+50		44+43	87
Parsnip	50+50		19+26	45
Salsify	50+50		37+44	81
Onion	50+50		47+48	95
Corn	25+25		25+24	98
Beans	25+25		23+21	88

To show an average of the good seeds from each firm above would be hardly fair, as the kinds of seeds are not identical. Yellow Danver's Onions are found in each lot, and will be seen to run as follows:

Lyman Seed Co.	43	per cent germinated.
D. M. Ferry & Co.	65	" "
Detroit Seed Co,	70	" "
Briggs Brothers	77	" "
Shaker Seed Co.	90	" "
Agricultural College	95	" "

Cabbage germinated as follows:

Lyman Seed Co.	50	per cent.
Detroit Seed Co.	59	" "
Briggs Brothers	70	" "
Shaker Seed Co.	88	" "
Agricultural College	87	" "

SEEDS PURCHASED OF THE SEEDSMEN AND TESTED IN THE GREENHOUSE.

I wished to test the vitality and purity of the seeds sold by some of the seedsmen who make extensive sales, and who have the best reputation. As I had tested seeds the year previous, and the reports were quite extensively quoted by

the press, I feared I might not get fair average samples of seeds if they were ordered directly over my own name.

Seeds were ordered for me by a friend in a distant county of this State.

They were put in papers to test on June 16, and taken out June 30.

B. K. Bliss & Sons.

	Seeds Tested.	Seeds Germinated.	Per Cent.
Beet	50+50 pieces.	40+39	79
Carrot	50+50 seeds.	28+31	59
Corn	50+50	47+47	94
Cucumber	50+50	45+48	93
Cauliflower	50+50	31+27	58
Cabbage	50+50	37+38	75
Lettuce	50+50	41+34	75
Onions	50+50	20+23	43
Parsnips	50+50	38+40	78
Peas	25+25	25+25	100
Radish	50+50	34+40	74
Tomato	50+50	26+25	51

D. M. Ferry & Co.

Beet	50+50 pieces.	39+43	82
Carrot	50+50	24+43	67
Cucumber	10	9	90
Cabbage	50+50	28+34	62
Lettuce	50+50	1+2	3
Onions	50+50	39+39	78
Parsnips	50+50	41+44	85
Radish	50+50	30+27	57
Squash	10+10	9+10	94
Tomato	50+50	6+14	20

J. J. H. Gregory.

Beet	50+50	44+39	83
Carrot	50+50	39+41	80
Cauliflower	50+50	36+37	73
Cucumber	50+50	41+41	82
Cabbage	50+50	44+47	91
Corn	50+50	39+40	79
Lettuce	50+50	2+0	2
Onions	50+50	26+20	46
Parsnips	50+50	38+41	79
Squash	10+10	10+10	100
Salsify	50+50	44+44	88
Tomato	50+50	47+49	96

Peter Henderson.

Beet	50+50 pieces.	36+37	73
Carrot	50+50	34+31	65
Cucumber	50+50	34+41	75
Cauliflower	50+50	27+34	61
Cabbage	50+50	32+39	71
Lettuce	50+50	37+31	68
Onions	50+50	44+41	85
Parsnip	50+50	31+40	71
Radish	50+50	45+40	85
Salsify	50+50	40+43	83
Tomato	50+50	31+38	69

J. M. Thorburn & Co.

Beet	50+50 pieces	39+43	82
Carrot	50+50 seeds	48+49	97
Cucumber	50+50	19+26	45

	Seeds Tested.	Seeds Germinated.	Per Cent.
Cauliflower	50+50	46+43	89
Cabbage	50+50	34+31	65
Lettuce	50+50	43+39	82
Onions	50+50	47+48	95
Parsnip	50+50	44+45	89
Radish	50+50	45+45	90
Salsify	50+50	38+41	79
Squash	10+10	10+10	100
Tomato	50+50	41+10	51

James Vick.

Beet	50+50 pieces	34+34	68
Carrot	50+50 seeds	29+30	59
Corn	50+50	36+41	77
Cucumber	50+50	40+37	77
Cauliflower	50+50	26+30	56
Cabbage	50+50	46+43	89
Lettuce	50+50	40+29	69
Onion	50+50	41+43	84
Parsnip	50+50	29+32	61
Radish	50+50	46+44	90
Salsify	50+50	43+47	90
Tomato	50+50	25+36	61

A COMPARISON.

Below I give a table comparing the same varieties of seeds of each firm the seeds of which were tested.

I give the per cent of seeds which germinated in each case, then the average for the eight varieties.

	Bliss.	Ferry.	Gregory.	Henderson.	Thorburn.	Vick.
Beets	79	82	83	73	82	68
Carrots	59	67	80	65	97	59
Cucumber	93	90	82	75	45	77
Cabbage	75	62	91	71	65	89
Lettuce	75	3	2	68	82	69
Onion	43	78	46	85	95	84
Parsnip	78	85	79	71	89	61
Tomato	51	20	96	69	51	61
Average	69	61	70	65	76	71

The average is not exact, but very near in each case.

The above were tested together in the same room. Perhaps the most striking thing in the last table, or in all of them is the uneven size of the figures. Seedsmen generally refuse to guarantee that their seeds will grow, but claim to exercise all diligence in testing their seeds before sending them out. It would seem a needless oversight to send out seeds which run as low as some of those run from each of the firms above mentioned.

In most cases I think that the above average is lower than it should be were proper care taken to throw out poor seeds.

The tables should impress this important fact on the minds of all who grow vegetables—that for good, pure seeds, the only reliable way is to raise them yourself, even if they cost five times as much as it does to buy them. If they are purchased, it will pay to buy early and then test before sowing for the main crop.

SEEDS TESTED IN THE GARDEN.

Some persons may think it the fairest kind of a test to plant seeds at the proper season in good garden soil in the open air. In such a place it is impossible to protect them from damage from various sources, such as moles, mice, and numerous kinds of insects. The results will be more uncertain and unsatisfactory than when tested in the greenhouse, especially if the test is made on a small scale.

On an even spot of sandy loam, on May 18th, we planted the following varieties named below with the results as there given:

B. K. Bliss & Sons.

	Planted.	Came up.
Beet	50	43
Carrot	50	6
Corn	30	23
Cucumber	15	9
Cauliflower	30	17
Cabbage	30	23
Lettuce	50	25
Onion	50	0
Parsnip	50	12
Pea	20	16
Radish	30	19
Tomato	30	10

J. J. H. Gregory.

	Planted.	Came up.
Beet	50	48
Carrot	50	9
Corn	30	18
Cucumber	15	9
Cauliflower	30	10
Cabbage	30	19
Lettuce	50	0
Onion	50	9
Parsnip	50	17
Radish	30	25
Salsify	50	18
Squash	8	8
Tomato	30	14

Briggs Brothers.

	Planted.	Came up.
Beet	50	19
Carrot	50	11
Lettuce	50	9
Onion	50	17
Parsnip	50	1
Salsify	50	16
Tomato	30	21

James Vick.

	Planted.	Came up.
Beet	50	32
Carrot	50	7
Corn	30	16
Cucumber	15	10
Cauliflower	30	20
Cabbage	30	22
Lettuce	50	27
Onion	50	12
Parsnip	50	5
Radish	30	18
Salsify	50	19
Squash	8	7

D. M. Ferry & Co.

	Planted.	Came up
Beet	50	28
Carrot	50	8
Cucumber	15	8
Cabbage	30	4
Lettuce	50	0
Onion	50	17
Parsnip	50	14
Radish	30	19
Squash	8	4

Peter Henderson.

	Planted.	Came up
Beet	50	25
Carrot	50	5
Cucumber	15	10
Cauliflower	30	15
Cabbage	30	19
Lettuce	50	21
Onion	50	7
Parsnip	50	4
Radish	30	22
Salsify	50	21
Squash	8	6
Tomato	30	8

J. M. Thorburn & Co.

	Planted.	Came up
Beet	50	17
Carrot	50	17
Cucumber	15	4
Cauliflower	30	20
Cabbage	30	25
Lettuce	50	9
Onion	50	14
Parsnip	50	12
Radish	30	19
Salsify	50	20
Squash	8	4
Tomato	30	19

Seeds from Bliss averaged in germination 53 per cent.; Ferry, 34 per cent.; Gregory, 48; Briggs, 31; Vick, 51; Henderson, 43; Thorburn, 44.

ARBORETUM AND NURSERY.

This piece of ground of two or three acres contains a great variety of plants. At present there are about five hundred species. First there are a few rows of each of our best forest trees which we are growing for timber, an account of which was given in my last report. The number has been considerably increased the past year. They have generally done well, though the spring growth was cut off by a severe frost.

My plan is next spring to remove most of the sample trees and shrubs to the place assigned by the Board for that purpose. Some of the most interesting species will be used about the buildings and in groups on the lawn. The perennial herbs will be transferred to a wild garden near the greenhouse; the seedling fruits, etc., to the garden north of the farm house.

On this piece of land is a screen which serves an excellent purpose. It is made of posts extending about six feet above the ground. On these are placed poles which support brush enough to partially shade the ground below. Under this screen men can work at sowing, weeding, etc., etc. Here we start our seedling evergreens, strawberries, raspberries, gooseberries, currants, grapes, and

many other things. Near by are many seedling apples, pears, quinces, peaches, plums, cherries, lilacs, etc., etc. After removing a miscellaneous lot of these plants, the rows will be all filled out with various kinds of forest trees.

I cannot close this short paragraph without saying a word in praise of Professor C. S. Sargent, Director of the Botanic Gardens of Harvard University. As will be seen by consulting the list of donations in this and the two previous reports, he has sent without expense to the College a very large number of interesting and valuable plants, as evergreens, other trees, shrubs, hardy herbs and plants for the greenhouse.

THE LAWN, TREES, AND DRIVES.

Much more lawn has been kept closely mowed during this year than at any previous time since the College was established. Through carelessness the seed purchased and sown for lawn contained much ribbed grass or lance-leaved plaintain *(Plantago lanceolata)*. The flower stalks of this troublesome weed start up so much quicker than the stalks of the grasses proper that the lawn mower will not cut them unless the ground is gone over about once in four days. The numerous scattered tops of these plaintains impair the beauty of a lawn. For a lawn (or meadow either) no seed should be sown until it is examined for the seeds of ribbed grass, which if found should be enough to condemn as unreliable the man who offers it for sale.

Considerable labor has been spent in grading about Wells hall. Owing to lack of team work it could not be done in time for seeding in spring. It is now nearly ready for seeding this autumn.

The site of the old dormitory, which was destroyed by fire, has at last been smoothly graded after removing the foundation and broken bricks. Some grading has been done near the houses of Professors Cook and Kedzie and Secretary Baird.

Some gravel has been added to the drives, mostly through the kindness of the Farm Department whose teams have done the work. Considerable fine gravel has been found in streaks with sand between the greenhouse and Wells hall.

This has been or will be drawn to fill up or finish drives already made, where they have settled or have been washed by rains. The removal of this gravel will open a slight depression between the two buildings referred to, and improve the appearance of the lawn.

Gravelling the drives, like some other things, progresses slowly. Something more will be done this fall and winter if the weather holds out favorable.

An account of the trees on the College grounds will be found on another page. Some trees have been added; all have been well cared for and have made a fine growth.

We have plowed, cultivated, and expect soon to grade the strip by the roadside for the entire distance on the north end of the farm. A double row of American elms will be set along the road this fall and next spring.

Some floodwood, old stumps and the like have been removed from the river. A small beginning has been made to improve the steep bank near the house of the President. The dead trees and logs and much poison ivy have been removed and a little thinning of trees made in certain places to expose the best views. A wild footpath or ramble has been begun along this bank, where now and then will be placed rustic seats and arbors.

THE WILD GARDEN.

For some years I have been trying to get the time and the students' labor to improve the bank west of the green house and convert it into a wild garden, a garden which should contain our most beautiful wild plants. A beginning was made last summer. The trees were thinned a little, taking care to leave one or more of each kind. The grass and weeds were taken out. Some flat boulder stones were placed on the bank in a manner to leave little open spaces or pockets, in each of which was set one species of plant. At the foot of the bank is a small pond and near it a low strip for bog or marsh plants.

Several students have shown a great interest in this work of preparing the garden, collecting and arranging the plants. These are all plainly labelled. Here we already have three hundred or more species, and expect soon to have all of our hardy ferns, orchids, violets, lilies, buttercups, anemones, arisaemas. We have a caltha, a calla, Jeffersonia, dicentra, mayflower, hibiscus, hepatica, hydrastis, cardinal flower, several species of phlox, a bloodroot, Solomon's seal and its allies, aquilegias, wild yam, ground nut, wild cucumber, sun dew, lemna, gentians. We have some foreign species sent by Harvard University. In some cases, as of hepatica, I selected them on account of the deep blue or the pink or the pure white of the flowers. Some flowers of the hepatica were double. The pond contains some fish, plenty of frogs, and a good variety of water plants.

Our students agree with me in saying that this is becoming one of the most attractive spots on the College grounds. Visitors also coincide with our views, if we judge by their comments and the numbers who collect there. The wild garden costs but little, much can be learned from it: it is one of the many things which adds a charm to rural life.

GREENHOUSE.*

The plants are generally in good condition. Two hundred and thirty species and varieties have been acquired during the year by purchase, donation, and exchange, several of which are of particular interest. We now have about 9,000 plants of 1,180 species and varieties, many of which are used for the decoration of the grounds around the plant-houses and other college buildings, during the summer. The want of more room is much felt owing to the yearly increasing growth of many of the specimen plants, curtailing the space devoted to the growing of plants for the trade, rendering very necessary the completion of the propagating pits. If it be advisable to compete with the trade, I would recommend the issuing of a catalogue and the finishing of these pits. The expenses of the establishment would then be defrayed, largely, by the increase sales of plants, flowers, and early vegetable plants.

FLOWER GROUNDS.

The bedding has been better than usual, owing partly to a better supply of water, and partly to the possession of better material for planting. The best bed of foliage plants was circular in form, 14 feet in diameter; the plants were disposed somewhat in the form of a maltese cross. The plants employed were Salvia officinalis, Centauria candidia, and Achyranthus Lindeni, surrounded by a circle each of golden pyrethrum, and Alternanthua amanæa. This bed was

* The part referring to greenhouse and flower grounds was prepared by Mr. Cassidy.

very effective. Plants which light up the landscape like these are the most desirable. Another circular bed, 20 feet in diameter, was planted with Coleus Verschaffeltii, in the form of a star and the points filled in with Pelargonium, Flower of Day, edged with a circle each of Golden Pyrethrum and Alternanthira amæna. This would be improved if Flower of Day were replaced by either Pelargonium, Albion Cliffs, or Centaurea candida. Another circular bed, 12 feet in diameter, was cut up in sections by planting lines of Centaurea gymnocarpa; the panels were planted with Achyranthes Lindeni, Cinararia Acantharfolia, and Golden Pyrethrum, edged with circles of Lobelia speciosa and Alternanthera versicolor. Plants with colored foliage are very effective for this style of gardening, as they do not need the care and attention required for flowering plants, nor is their beauty impaired by either sun or rain. They should be massed in beds of simple form, such as circles and ovals. For flowering plants, nothing beats the Pelargoniums. They should be planted in masses of one kind and edged with something of a different color. But few white flowered varieties are fit for bedding, but their place is well supplied by silver leaf Albion Cliffs.

Among bronze leaf varieties the best are the Moor, Earl Rosslyn, and Harold. They are striking in small beds by themselves, their brilliant chesnut zones showing to the best advantage next the grass, with no dividing line whatever. The golden tri-colors are not a success in our climate. Mrs. Pollock is the best, partly because its lighter colored leaf enables it to stand the sun better than those with darker zones. The dark Coleus, Emperor Napoleon, is a good edging for this section, as it throws the colors of the pelargonium into high relief.

The following are among the best of the new French and English pelargoniums. They were fully tested on these grounds the past season, and were admitted to be a decided improvement on the old varieties. The best doubles are President Hayes, Depute Berlet, Depute Bio, Depute Laflize, Depute Barroy, Lewis Boutard, Mons. Lowagie. The best singles are Cyclops, Dazzler, Gen. Chamzy, Jealousy, Edwig Bellot, P. L. Courier, and Mad. Quinete. The new double pelargoniums are noticeable for the extraordinary size of both trusses and individual flowers and the great varieties of new shades and colors they comprise, added to great freedom of bloom. As edgings to pelargoniums, variegated alyssum and centauria candida are among the best. The alyssum when well grown and bloomed produces the most harmonious effects from the combination of foliage and flowers. Then centauria if planted too close in a wet season is liable to damp off. A bed of succulents was tried this year, but owing to a lack of quantity in some varieties it was not as effective as it otherwise would have been. A great variety of these plants may be grown together, such as agaves, echeverias, and sempervivums, carpeting the whole with sedum corsicum or primiosum. Geometrical designs of any kind may be worked out with these plants, bearing in mind that the best effects depend on careful and exact planting. A circular bed fourteen feet in diameter was planted with canna marechal vaillant, gynothrix latifolia, ericanthus ravennae, finished by circles of canna tricolor. Coleus, Grand Duke, golden pyrethrum, and variegated alyssum. Cannas take a front rank for beauty, habit, rapid growth, and in some varieties for profusion of flowers. The centers of such beds should be planted with tubers and edged with seedlings of some dwarf variety such as limbatta. For color use pelargonium, golden pyrethrum, or achyranthes lindeni; and bed would be improved by carpeting with such dense, dwarf-growing

plants as lobelia pumila or nierembergia gracilis. A large irregular shaped bed of double seedling petunia was very showy, but would be better if only one variety was used, The soil of beds should be rich and not less than three feet deep. The best mulch is that of two or three inches of spent hops put on at time of planting. In order to have fine blooms some protection is necessary against our violent rain storms, such as light wooden frames larger than the beds and covered with cotton cloth, because a heavy rain will spoil pelargoniums for at least two weeks.

VISITORS.

During the past year the number of visitors has much increased. They come from other colleges in other States, and from all parts of the country. Numerous granges and neighborhoods of farmers have paid us a visit. Many of these persons, especially the farmers, have never visited their institutions of learning, or, at least, not for several years. Too many come in winter when little is to be seen; too few in early summer, when everything appears to best advantage. Some have considered the College a useless tax on the people because they have not taken the trouble to go and see it, or because they had not tried to get the reports and read for themselves. Such men know almost nothing about it. They have certain theories picked up from various sources. We are glad to see a change for the better in this respect. We are trying to reach the farmers in all manner of ways, by our reports, by writing for the papers, making experiments, by farmer's institutes, etc. We want the earnest co-operation of every true farmer. We are doing all we can for their interest. Let them come and see. Remember this early next summer.

When a company visits us they let us know before hand. The party meets in the chapel for a few moments, where they are briefly instructed as to some of the experiments, where to find the orchards, vineyards, gardens, nursery, wild gardens, greenhouse, plats of grasses and large plants, plats of corn and wheat, etc., and potatoes, the fields, the cattle, the various buildings, the museum, library, etc. They take notes of these. They put out their horses; take their lunch in the grove, and stroll about in small companies as they may wish. The College flag is raised and perhaps the College cornet band gives them music.

Taking into consideration the unfavorable soil and climate at the Agricultura College, it is my ambition to do what I can to produce the best experimental orchards of apples, pears, quinces, plums, cherries, grapes, the most interesting vegetable and flower gardens.

I am trying to make the college grounds the most beautiful and attractive of any in our state. The rich man can imitate or copy a fine place; the poor man can see something which he can adapt to his own use even on his small farm or in his small yard or garden. Those who have no places of their own are the very persons most of all who are benefited by seeing a fine farm with attractive surroundings. They pay no tax; they can come and see, and if they have the capacity, they can enjoy "without money and without price." Any nice field, garden, animal, orchard, grass-plat, shade tree, flower-bed, exerts a pleasant and refining influence on the beholder. He is made better for having seen it.

WORK IN WINTER VACATION.

I had need enough of rest and work enough to do at home in the line of preparing or revising lectures. My winter vacation, as will be seen, afforded

little time for recreation or study. I render any assistance I can to promote the best interests of our farmers. I wish to make their acquaintance and get them interested in our work at their college. I have seen good results from such efforts.

I have lectured at a school for teachers at Pine Lake, at Rose Church, three or more times at Capital Grange; also in South Haven, Galesburg, before the Ingham County Farmers' Club held in Mason, a farmers' institute held at Manchester, High School at Lapeer, twice at Pomona Grange of Ingham county, Grange at Battle Creek, and Grange at Okemos. I attended the meeting of the State Pomological Society in Grand Rapids, and read my report as chairman of the orchard committee; also read a paper on Hybridizing Plants at a meeting of the same society held in Allegan, and another on teaching horticulture and horticultural experiments at the Agricultural College, and another on Forestry. I attended all of the six farmers' institutes, lectured at four of them, and answered numerous questions and took part in the discussions at all of them. I attended the winter meeting of the State Teachers' Association in East Saginaw, and took part in the exercises; also the harvest festival of Pomona Grange, and a similar festival in Ionia.

Besides the above, I have declined numerous requests to lecture in other places in this and in other States.

I have many letters to answer,—many with questions about grasses, weeds, bee-plants, etc., coming from Texas to Canada and New York to California. Many inquiries have been made by the agricultural press, especially by papers in our own State. All these have received prompt and courteous replies. As previously mentioned, the account of experiments made last year has been very extensively quoted by the press, showing that there is an interest in experiments in horticulture and kindred topics. If this be the case when scarcely any money is employed for experiments, and when the instructor is working in vacation and performing the work of one man in the class-room and the work of another in the gardens and orchards, might not we expect much better things in this direction with more money and some assistance?

I cannot close without expressing my gratification at the zeal and faithfulness of all who have been trusted with responsible positions in the Horticultural Department. The officers of the Agricultural and Horticultural departments, from the highest to the lowest, have often worked together, borrowed from each other and helped each other, and all with the utmost good feeling. I am not able to recall an unpleasant or an ungenerous act on either side.

W. J. BEAL,

Professor of Botany and Horticulture.

A BRIEF AND POPULAR ACCOUNT OF THE TREES AND SOME OF THE SHRUBS ON THE GROUNDS OF THE MICHIGAN STATE AGRICULTURAL COLLEGE,* SEPTEMBER, 1878.

BY PROF. W. J. BEAL.

AILANTHUS—*Ailanthus glandulosus.*

This tree comes from China. It is scarcely hardy at Lansing. The wood is coarse grained and handsome. The tree suckers badly in mellow ground. There is one specimen in the north-western part of the arboretum.

ALDER, SMOOTH—*Alnus serrulata.*

This large shrub is occasionally found about Lansing. A specimen can be seen near the drive southeast of the house of Prof. Cook, also others in the arboretum.

ALDER, IMPERIAL CUT-LEAVED—*Alnus glutinosa, var. laciniata imperialis.*

This is a charming variety of the European alder. A good specimen can be seen near the drive between the greenhouse and the chemical laboratory.

ARBOR VITÆ, AMERICAN—*Thuja occidentalis.*

This is generally known in Michigan as white cedar. It is too common to need description. The leaves are very small, round pointed, and in four rows on flattened branches, which grow in flattened clusters. In time they all fall off, some of the older ones each autumn. On the main thrifty branches the leaves are prickly awl-shaped. The cones are small, and in autumn when they assume a yellow color are very beautiful. In winter the cones become brown and dingy. It grows fifty feet high, and sometimes four feet or more in diameter. It is a worthy tree, a general favorite for ornamental grounds. It bears the shears well, and is the most often recommended of any tree for ornamental screens. One of its faults is that of becoming dingy in winter. On light, dry soil it grows slowly and thin, and, when left to itself, becomes a dingy, poor-shaped tree. Some thrifty young specimens are very hard to equal by any other tree. Fine specimens on the College grounds are found north of the greenhouse on the bank; larger specimens north and not far from the big stone. From this species numerous dwarf varieties have originated which are quite popular.

ARBOR VITÆ, SIBERIAN—*Thuja occidentalis, var. Sibirica.*

This is a variety of the preceding species. The name Siberian must not mislead anyone to think it ever originated in Siberia. It is a compact, sturdy, dark green shrub, with many peculiarities of the arbor vitæ. It is very suitable for planting in small places, in country lots, and for screens. At the College a specimen grows west of and near the drive by college hall, also southwest of the chemical laboratory and south of the drive.

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* This does not include nearly all the kinds of trees growing in the arboretum.

ARBOR VITÆ, GLOBE-HEADED—*Thuja occidentalis globosa.*

This is a beautiful, round-headed variety, a good specimen of which stands east of the greenhouse.

ARBOR VITÆ, HEATH-LEAVED—*Thuja occidentalis ericoides.*

This is another dense dwarf variety of the American species. A good specimen stands near the eastern end of the greenhouse.

ARBOR VITÆ, CHINESE—*Thuja (Biota) orientalis.*

This species and its numerous varieties have not proved entirely hardy at this place. Two severe winters within a few years have swept off every specimen except those which were covered by a screen. There is a group of these plants set among larger trees southeast of the residence of Prof. Beal.

ASH, BLACK—*Fraxinus sambucifolia.*

This thrives in swamps and on river bottoms where it becomes a tall tree. It is used for barrel-hoops, and within a few years it has been employed in making nice furniture. At the College a small tree may be seen on the flats near the rockery west of the greenhouse, also east of south of Secretary Baird's house, also along the river banks.

ASH, BLUE—*Fraxinus quadrangulata.*

This small tree prefers rich loamy land. It is the only one of our ashes which has branches which are square until they are over a year old. It grows slowly. The timber is durable for sills, posts, and rails. It is beautiful for furniture and finishing the interior of houses. Trees are not very plenty about Lansing. On the College grounds there are only small specimens which are found in the arboretum.

ASH, GREEN—*Fraxinus viridis.*

This is a small tree much resembling whiteash. It is found on rich banks. At the College small specimens may be seen in the arboretum.

ASH, GOLD-SPOTTED—*Fraxinus Americana, var. punctata.*

A small tree can be seen between the greenhouse and the chemical laboratory.

ASH, MOUNTAIN—*Pyrus Americana.*

It is unfortunate that the name of ash was ever applied to this tree. It is related to the apples rather than to the true ashes. It is a small tree, often cultivated for ornament. It is found in some parts of northern Michigan, as about Ludington. On the College grounds there are several specimens north of west of the greenhouse about five rods, also one southwest of the house occupied by Dr. Kedzie. They are often short lived, and are likely to be troubled with borers.

ASH, OAK-LEAVED MOUNTAIN—*Pyrus aucuparia, var. quercifolia.*

This is a variety of European Mountain Ash, which has simple and deeply lobed leaves. A small tree may be found about six rods southwest of the President's house.

ASH, PRICKLY—*Zanthoxylum Americanum.*

This large shrub is also sometimes called toothache-tree. It is in no way nearly related to the mountain ash or the large forest trees called ashes. It grows on rich bottom land. There are some small specimens in the nursery, and in a sample hedge due north of the farm house.

ASH, RED—*Fraxinus pubescens.*

This small tree too closely resembles the white ash. The leaves and the rest of the annual growth are finely or velvety-pubercent. It grows on river bottoms. At the College, samples may be found, one in the grove south of the east part of Williams hall, also on the flats near the rockery west of the greenhouse, also two small trees west of the chemical laboratory and south of the road bridge over the brook.

ASH, SWAMP.

See black ash.

ASH, WATER.

See black ash.

ASH, WHITE—*Fraxinus Americana.*

This becomes a large tall tree, and has a wide range. It is quite common in our State. It grows rapidly and thrives on a variety of soil, and has very few enemies. It is one of our most valuable trees for cabinet-ware, finishing off houses, and for farm implements, and for numerous other purposes where strength, beauty, and elasticity are required. The seeds are easily obtained, and are sure to grow. In my estimation, it is one of the best and most promising trees to raise in Michigan for its timber. At the College a nice tree grows a few rods southwest of Dr. Kedzie's house, also in the grove south of Williams hall; also in the grove west of the arboretum; also east of north of Williams hall about ten rods, and in the grove in the hollow north of College hall.

ASPEN, AMERICAN—*Populus tremuloides.*

This small tree is common in many portions of the State. A tree stands in tha hollow a little south of a line connecting the barns of Professor Cook and Secretary Baird, also numerous specimens along the river bank opposite the house of the President of the College.

ASPEN, LARGE TOOTHED—*Populus grandidentata.*

This tree is quite common about the neighborhood, where it acquires a diamter of a foot or more. A specimen stands in the grove southwest of Williams hall, also many specimens in the forest northwest of the College.

ASPEN, WEEPING LARGE TOOTHED POPLAR—*Populus grandidentata pendula.*

This is a weeping variety usually budded on Lombardy poplar. A specimen stands west of a line on the lawn between Wells hall and the Chemical Laboratory.

BALM OF GILEAD FIR—*Abies pectinata.*

This comes from Europe, where it is highly esteemed. The leaves are broader than those of our balsam-fir, which it much resembles. A specimen

was presented to the College by Mr. Taylor, of Kalamazoo. The tree stands in the grove south of the house of Prof. Cook. It is not quite hardy in this part of Michigan.

BALM OF GILEAD, POPLAR—*Populus balsamifera, var. candicans.*

This rapid growing tree is abundant at Sanford, on the Flint and Pere Marquette railroad. It is often cultivated, though I can hardly see anything to recommend it except its rapid growth. A few specimens grow in the arboretum.

BALSAM FIR—*Abies balsamea.*

This tree is a rather small slender evergreen which grows in the swamps in the northern portion of our State. It thrives on dry land as well as in swamps. In some places it has been much used as an ornamental tree. It usually looks well until it gets to be ten or fifteen years old when the lower limbs become thin and the tree puts on a shabby appearance. It is a good tree to place among others to shade them and produce a temporary effect and then it should be cut out or removed for trees which better retain their beauty in old age. Specimens may be seen in the wild garden.

BARBERRY, COMMON—*Berberis vulgaris.*

This interesting hardy shrub comes from Europe, but has become naturalized in some of the older portions of New England. Some specimens can be seen a few feet south east of College hall, also in the grove south of Professor Cook's house.

BASSWOOD—*Tilia Americana.*

This tree abounds in the rich woods of many portions of the State, where it is well known. It is a favorite tree with those who keep bees. The timber is valuable for a variety of purposes. It is a fine ornamental tree of rapid growth and fine habit. At the College specimens may be seen on the flats in numerous places, also south of the east end of the road bridge by the chemical laboratory, also south and also east of the house of Professor Cook.

BEECH, AMERICAN—*Fagus ferruginea.*

This well known tree is very widely distributed in our State. It grows slowly and the timber decays rapidly if allowed to become alternately wet and dry. Its chief uses are for fire wood, some tools, roof boards, etc. The roots run near the surface of the ground, so the tree will not thrive well in the grass unless there is a liberal top dressing. The most beautiful tree on the College farm is in the pasture northeast of the house occupied by Professor Fairchild, also one near the east end of the rustic road bridge, and several others which are slowly dying in various spots on the lawn.

BEECH, BLUE—*Carpinus Americana.*

This small tree is abundant along streams. Its chief uses are for whip-stocks, withes, and in former times to switch the naughty boys and girls. With room enough for development in proper soil it becomes a compact, beautiful and symmetrical shrub, especially when bearing its fruit, which is inclosed by

two peculiar bracts. Specimens may be seen on the banks near the rockery, also along Cedar creek.

BIRCH, BLACK—*Betula lenta.*

This is found in swamps in this vicinity, and is easily detected by the children on account of its bark, which has the taste of wintergreens. It was once much employed in school rooms, where it was supposed to be necessary to help maintain order. It is excellent for fuel, and for turning, and for splint brooms. Specimens may be seen near the rockery: also in the swamps in this vicinity.

BIRCH, CHERRY.

See birch, black.

BIRCH, CUT-LEAVED WEEPING—*Betula alba, var. pendula laciniata.*

This is a cut-leaved weeping variety of the white birch. It stands unrivaled among deciduous weeping trees. It is distinguished for its hardiness, tall, slender trunk, graceful drooping branches, white bark, and finely cut leaves. It is particularly well adapted for cemeteries and for small grounds. It is one of the trees which should stand a little way from all others, where it can display to good advantage many of its good qualities. No list of ornamental trees is complete without one or more of this variety. The finest specimen at the College grows west of the house of Professor Beal and south of the house of Professor Cook; also another southwest of College Hall about ten rods; also east of the greenhouse a few rods.

BIRCH, SWEET.

See birch, black.

BIRCH, WHITE—*Betula alba, var. populifolia.*

This tree is abundant on thin soil in northern Michigan. It is a nice, small tree, valuable for ornament. A fine specimen stands a little east of the foot bridge by the willows on the north side of the path; also in the grove south of Professor Cook's house; also in groups north and a little east of Williams hall half way or more to the road; also south of the apiary. A few have been seen growing wild in the neighborhood of the College. This is not the canoe or paper birch.

BITTERNUT—*Carya amara.*

This is a slow growing tree found on moist soil. Its chief value is for firewood. Two trees may be found within two rods southeast of the house of Professor Cook.

BLADDERNUT—*Staphylea trifolia.*

This large handsome shrub is common along river bottoms. A specimen stands close to College hall by the foot of the west stairway on the south side; also in the grove close to and north of the College well; also along the Cedar river south of the greenhouse; also in the arboretum.

BOX-ELDER—*Negundo aceroides.*

This beautiful tree grows rapidly but soon becomes crooked and out of shape. It is found along our river banks. The leaflets much resemble those

of poison ivy. The tree is closely related to the maples. Sugar may be made from the sap. Some thrifty specimens may be found in the arboretum, and others will soon be planted on the College lawn. Other trees thrive along the river below the College farm.

BUCK THORN—*Rhamnus cathartieus.*

This is a favorite hedge plant in some portions of Europe. Sample specimens grow east of the College well, also near and west of College hall. These were set by Professor J. C. Holmes, and were brought from his place in Detroit.

BUTTERNUT—*Juglans cinerea.*

In our rich woods this becomes a large tree as far north as Saginaw, and perhaps much farther in favored localities. In open places the top spreads wide and becomes open and thin. The timber is used to some extent for furniture. Specimens may be seen in the arboretum.

BUTTONWOOD—*Platanus occidentalis.*

Probably no tree in the State acquires a greater diameter than the buttonwood on rich bottom lands. It is often hollow. The wood is of little value on account of warping and checking, although the boards are quite handsome. A large specimen stands across the Cedar river southwest from the house of the President. It is twenty-two feet and seven inches in circumference in the smallest place. It soon divides into several branches. The top limbs are partly dead. This tree is rather picturesque and stands in a good spot as an ornament to the College grounds. Another specimen stands in the south part of the grove south of the house of Professor Cook: also in groves northeast of Williams hall.

CATALPA—*Catalpa bignonioides.*

This rapid growing tree belongs farther south and west. It appears as an ornamental tree on some places in our State. The timber is very durable for posts and railway ties. The growing of this tree is highly recommended for its timber where the climate will permit. The wood is soft, light and beautiful when polished. A few four-year old trees at the College may be seen in the arboretum; also in the wild garden, and others will soon be planted on the lawn.

CEDAR, RED—*Juniperus Virginiana.*

This tree is pretty well known all over the northern States where it grows about lakes, along streams usually in small quantity. In Tennessee it is very abundant in some places. The beautiful red fragrant wood is a great favorite for many purposes. The tree usually grows slow, but on a good soil it grows fast in our State, at least for some years. It is one of the hardiest trees and bears the shears as well as any tree we have. It becomes a beautiful tree whether trimmed on a lawn near buildings or left to assume picturesque forms on the slopes of streams or on rocky hills. Almost its only fault is that of turning quite a dark dingy brown in cold weather. In some parts of New Jersey and, I presume, of other Atlantic States, old red cedars are allowed to grow along the fences, about the fields, and in waste places. Some of these are very fine in appearance, though often appearing in part or in the whole as if the branches had been sheared closely. At the College, some trees are growing on the high river bank on the north side of the stream, also two on the bank

of the brook on the grounds between the College buildings and the Professors' houses. The stream through the College farm is called "Cedar River," on account of these trees on its banks. A nice thrifty tree grows southwest of Professor Beal's house. It has been cut back for several years. It was taken from the river bank and planted by President Abbot for and in the name of his son Rodney.

CEDAR, WHITE—*Cupressus thyoides.*

This must not be confounded with the arbor vitæ, which is so often called white cedar. I cannot hear of it as a native of Michigan, though I have looked and inquired a good deal in the southern peninsula. Farther north, I still have hopes of finding it. It belongs nearer the east coast of the United States, where it is quite common in marshes or swamps, especially southward. In style it is somewhat intermediate between the arbor vitæ and the cypresses, having the fan-shaped foliage of the former. The wood is light, fragrant and very durable. Specimens may be seen in the arboretum; also in the wild garden.

CHERRY, BLACK—*Prunus serotina.*

This is a fine forest tree. The wood is quite durable for posts and rails. The lumber is considerably used for furniture, but it is not so popular as formerly, perhaps because its color can be so easily imitated by painting or staining. Some of it much resembles mahogany.

At the College, a fine tree may be seen about a rod from the northeast corner of the residence of Professor Beal. There is also a tree of this kind in the road about half-way between the College and the city of Lansing. The one last referred to is not in a very thriving condition, partly owing to caterpillars, but mostly owing to its narrow quarters between two large flat stones, which are yearly separated by the growing tree.

CHERRY, CHOKE—*Prunus Virginiana.*

This is a beautiful large shrub, common along low ground and river banks. When in flower there is scarcely a more beautiful shrub on the College grounds. A great tendency to send up sprouts is its greatest fault. A good specimen can be found about half way between College hall and the chemical laboratory, also on the river bank near the drive towards the west entrance.

CHERRY, RED—*Prunus Pennsylvanica.*

This is not uncommon in rocky woods and along streams. It springs up in great abundance where the forests of pine have been burned over in the north part of the State. In such places it somewhat resembles a peach tree. Specimens may be seen in the arboretum.

CHESTNUT—*Castanea vesca.*

This well known tree is a favorite for its sweet nuts, for its beautiful appearance where used for finishing churches and for furniture; also for its great durability. The tree as a native of our State is confined to the highest land in the southeast part of the State in limited quantity, in Oakland, Washtenaw, Wayne, Monroe, and St. Clair counties. It grows well when planted on the sandy land at the Agricultural College. Two specimens

may be seen southwest a few rods from College hall, also one near the big stone, also north of College hall a few rods. These were set by Professor W. W. Tracy. The first nuts were borne in the year 1877.

CHESTNUT, DWARF OR ONE-SEEDED.

See Chinquapin.

CHINQUAPIN—*Castanea pumila.*

This interesting shrub or small tree grows naturally in Ohio and Pennsylvania. Some specimens have flowered in the arboretum.

CHESTNUT, HORSE—*Aesculus hippocastanum.*

This tree is a native of Europe and Asia, and is in no way nearly related to the common chestnut. The Buckeye in the southern part of the State is quite inferior to the above in appearance. On clay land it seems to thrive well, but not on sandy or gravelly soil. On the grounds of the State Capitol there are some good thrifty specimens. At the College on sandy places trees have generally died after a few years. A specimen stands northwest of College hall six or ten rods: others will be set on the clay land farther west. The round head of a well grown specimen, the drooping compound leaves of seven leaflets each, and the long erect lantern-shaped clusters of white flowers, give the tree a striking appearance unlike anything else.

COFFEE-TREE, KENTUCKY—*Gymnocladus Canadensis.*

This is in its prime farther south, though I have seen a tall tree eighteen inches in diameter as far north as Grand Ledge. It is not well known by the mass of the people. It is remarkable for its few thick, stumpy limbs, and large compound leaves. The tree sometimes bears large, thick, heavy pods an inch and a half wide by four inches in length. The wood is rose colored, showing the grain well. It is quite handsome when nicely finished. Two trees are within twenty rods and west of north of College hall, also north of and within two rods of the well, also along the Cedar river.

COTTONWOOD—*Populus monilifera.*

This rapid growing tree has very little to recommend it for timber, shade, shelter or ornament. A staminate tree may be seen half way between college hall and the house of Professor Beal, also in the road nearly opposite the dwelling house on the farm of Dr. Miles. A pistillate tree stands on the flats near the rockery west of the greenhouse. There is another species, known as cottonwood, which has not been found in this neighborhood.

CRAB-APPLE, AMERICAN—*Pyrus coronaria.*

This small hardy tree is remarkable for the fragrance of its beautiful rose-colored flowers. It is well worth a place in every yard of any extent. At the College it is used, to a small extent, for a hedge; also a tree is found south of the west steps by College hall.

CRANBERRY-TREE.

See snow-ball.

CUCUMBER-TREE—*Magnolia acuminata.*

This tree is known farther south, but I have been unable to find it in the

forests of Michigan. One of the finest trees in one of the yards in Kalamazoo is of this kind. It is a fine ornament to any place, provided the tree will endure the climate. A small specimen stands about three rods east of the south end of the chemical laboratory, also in the arboretum.

CYPRUS, BALD—*Toxodium distichum.*

This tree seems quite hardy on the dry sandy lawns of the College. Theoretically, no one would suspect that a tree from the swamps of Maryland and further south would stand any chance for life in the place just mentioned. Actual experiments are the only sure guide and they should be frequently tried under varied circumstances. This is a large and valuable tree in the swamps of the Southern States. As an ornamental tree it is very pretty. It puts forth its leavest quite late in spring and drops them early in autumn, that is, earlier than most other trees. The best specimen at the College grows on the lawn south and a little east of the house of the secretary, also a poorer one northwest about six rods from College Hall. They were set by Professor J. C. Holmes.

DOGWOOD, FLOWERING—*Cornus florida.*

This small, slow growing tree is very common in the woods about the College, where it makes a gay appearance in May. No fine specimen is on the College lawn.

ELM, AMERICAN—*Ulmus Americana.*

As an ornamental tree it stands without a rival among the deciduous leaved trees of this country. It is queen of the forest. It claims this high rank for its rapid growth, its hardiness, which adapts it alike to high land or low, rich or poor, loam or clay. It has beautiful leaves, a large majestic trunk, with graceful drooping branches. In most places it has but few enemies, among the worst of which are the canker worm in some localities and the woodman's axe.

Its thick tough bark adapts it to the street where it stands abuse as well as any other tree. At the College a specimen can be seen between the houses of Professors Fairchild and Beal, also east of this one a few rods, also on the flats near the brook west of College Hall, also east and very close to the north part of Dr. Kedzie's house, also there is to be a double row set along by the road which makes the north boundary of the College farm.

ELM, CORKY.

See rock elm.

ELM, ENGLISH—*Ulmus campestris.*

This is a large sturdy tree, but in nearly all respects inferior to the American elm. At the College there is one tree about six rods southwest of College Hall.

ELM, RED—*Ulmus fulva.*

This is a rather small tree of moderate growth. The leaves are very rough and spread irregularly, making a thin top unless it is cut back. The wood is quite durable. Every boy knows the tree by its mucilaginous bark. A tree stands close by the brook a few rods north of the rustic road bridge near the chemical laboratory, also near the drive on the bank about half way between the west front gate and the house of the President, also in the arboretum.

ELM, ROCK—*Ulmus racemosa.*

This valuable tree thrives on rich loamy land. It can be easily distinguished from the other elms by its corky limbs. It grows rather slow. The timber is valuable for some parts of farm implements, freight cars, etc., etc. It is tough, but a little inclined to warp and not to keep its shape. The wood is softer than white oak or hickory, except in a few cases. A specimen stands on the flats near the brook north of the rustic road bridge on the College grounds; also some may be seen in the grove of trees near the road opposite the house on the Parmelee place.

ELM, WHITE.

See rock elm; also American elm.

ELM, SLIPPERY.

See red elm.

ELM, WEEPING.

See American elm.

FILBERT—*Carylus Avellana.*

In the autumn of 1873 Professor Beal obtained seeds of filberts grown at Union Springs, Cayuga county, New York. From these sprung some thrifty plants now at the College. One stands in the hollow just south of the foot-path, between the houses of the Secretary and Professor Cook; also in the arboretum.

FIR, BALM OF GILEAD.

See balm of Gilead fir.

FIR, SILVER.

See balm of Gilead fir.

FIR, SCOTCH.

See Scotch pine.

FRINGE TREE—*Chionanthus Virginica.*

The shrub thrives in Pennsylvania and southward. Another shrub *(Rhus Cotinus)* is often called fringe tree by some people, but it is more properly called smoke tree. Early in June this true fringe tree produces loose panicles of flowers, each of which has four slender twisted petals an inch long. A specimen stands near the drive west of the south end of College hall, near the ginkgo tree. This came from Cambridge, Mass.

GINKGO TREE—*Salisburia adiantifolia.*

This peculiar tree is unlike any other tree with which I am acquainted. The leaves are deciduous, fan-shaped, with fork-veins, some like the leaflets of a maiden-hair fern, whence it takes its name. It should be planted not far from a path or building to show its peculiarities, which are very interesting. It becomes quite a tree, reaching 80 feet or more upward, with a large trunk, said to be six to twelve feet in diameter. It comes from Japan. Not a twig has been injured by our extreme winters, on our single thrifty specimen which grows in light, poor sandy soil. I know of a few others in various parts of the

State, and so far as my knowledge extends they are perfectly hardy and much liked. The leaves are very nice to put around the lower side of a hand bouquet. There is a specimen west of the north end and within two rods of College hall. This was set by Professor Thurber, and was sent by Dr. A. Gray from Cambridge, Mass.

GUM-TREE, SOUR.

See pepperidge.

GUM-TREE, SWEET—*Liquidamber styraciflua.*

This large and beautiful tree thrives in low ground from southern Illinois and southward. The leaves are deep crimson in autumn. The branches are corky. Three scrubby specimens can be seen in the arboretum, where it is killed back to some extent every winter.

HACKBERRY—*Celtis occidentalis.*

This tree is also sometimes called sugarberry, and nettle tree, and is sparingly found as far north as Midland in this State (and perhaps considerable farther), two feet or more in diameter. I have met but few people who knew the correct, or even any name for it. In three counties I hear it called shithim wood. I have often been questioned about this tree. It has rough bark, which turns over in thin rolls. The tree looks some like its cousins, the elms, having its simple leaves in two rows along on opposite sides of the stem the same as elms. The tree bears small sweet berries the size of peas. The wood is of little value except for fire-wood. Large specimens may be seen along Cedar river between the College and Lansing; also small specimens near the river on the College grounds and in the wild garden; also a twin specimen north of and near the gravel road a little west of the toll-gate, near North Lansing.

HAWTHORN—*Crataegus oxycantha flore punica.*

This showy shrub stands highly recommended among the hardy shrubs for the northern States, but it is not hardy at the Agricultural College.

A broken down specimen stands between the greenhouse and chemical laboratory.

HAWTHORN—*Crataegus.*

There are three or more species growing on the farm, the most beautiful of which is the cockspur thorn *Crataegus crus-galli.* One of the latter stands on the bank near the drive, west of the President's house.

HEMLOCK.

See spruce hemlock.

HICKORY, SHAG-BARK OR SHELL-BARK—*Carya alba.*

This well-known tree is valuable for its hard, heavy, tough wood. It also furnishes most of the hickory-nuts in the eastern markets. The nuts of another species, *Carya sulcata,* come from Ohio. The latter are large and have thick shells of a yellowish white color. The second growth of both species and one other is valuable for some parts of buggies, for ax-helves, etc.

For a specimen see a small tree south of and near the path between the house of the President and Prof. Carpenter, also small trees in the arboretum, also in the forests about the neighborhood.

HOP-HORNBEAM.

See iron wood.

HORNBEAM.

See blue beech.

HOP-TREE—*Ptelea trifoliata.*

This neat shrub thrives along our river banks. For samples, see arboretum, also thickets on the river bank, back of Wells' hall.

IRON-WOOD—*Ostrya Virginica.*

This small slow-growing tree is well known in our forests. The wood is very hard, heavy, and fine grained. It is a favorite for levers, beetles, wedges, pins, firewood, etc. Samples may be found on the bank north of the chemical laboratory, also in the grove southwest of Williams hall.

IVY, AMERICAN.

See Virginia creeper.

IVY, POISON—*Rhus toxicodendron.*

No plant on the College grounds is more famous than poison ivy, especially among that class of students who are poisoned by it. It trails along the ground or climbs trees. It has leaves composed of three leaflets. The American ivy has five leaflets. The latter is perfectly harmless and is justly a great favorite. Specimens of poison ivy can be seen (or handled) on the river bank almost any where south of the President's house, also one on an elm tree not far from the river near the four corners west of the College; also a labeled specimen on an island of the pond of the wild garden.

JUNE BERRY—*Amelanchier Canadensis.*

This beautiful shrub abounds in open woods in this vicinity. It varies a good deal in shape of leaf, mode of growth, etc. There are some dwarf forms. It puts forth an abundance of white flowers early in spring before the appearance of the leaves. It is worthy of a place among our ornamental shrubs, especially where the winters are very severe. For specimens, look on the south side and near the drive and west of the rustic road bridge, also about the apiary, also in the arboretum, also in the grove south of Professor Cook's house.

JUNIPER, IRISH—*Juniperis communis Hibernica.*

As the Latin name indicates, this is only one variety of our list of common junipers which are found in Europe and Asia as well as in North America. The variety is quite distinct in form. It is erect, often much the shape of a miniature Lombardy poplar. The leaves are short, sharp-pointed, glaucous green in whorles of three on the small limbs. The center of the shrub is too apt to be injured by our cold winters. It is especially valuable in formal gardens. At the College, one of the largest specimens grows north of and near College Hall; also in the arboretum. The large specimen came from the botanical garden, Cambridge, Mass.

JUNIPER, SWEDISH—*Juniper communis Suecica.*

This is much like the Irish juniper, only of a brighter color and more hardy. It attains a height of fifteen feet or more, and bears trimming well. See sample on the rockery northwest of the greenhouse.

LARCH, AMERICAN—*Larix Americana.*

This is very common in the swamps of Michigan, where it sometimes attains a diameter of two and a half or even three feet. On dry land it grows slowly. For samples see specimen west and northwest of the house of Professor Beal; also on the lawn in front of the house of Dr. Kedzie.

LARCH, EUROPEAN—*Larix Europæa.*

This is a much more thrifty tree than the above, and it thrives better on dry land instead of in swamps. The leaves are longer, the cones larger, and it has a more graceful habit. The timber is quite durable. The tree is highly recommended to plant for timber in this country. It should be in every collection of twenty kinds of trees. It may be trimmed to any shape. At the College is a nice specimen in the grove south of the house of Professor Cook, also in the hollow between Williams' hall and Wells' hall, also northwest of College hall. There are several other species of larch in the arboretum.

LEATHERWOOD—*Dirca polustris.*

This shrub thrives along our low rich land where it sometimes acquires a diameter of two or three inches. It puts out yellow flowers before the leaves very early in spring. It is remarkable as possessing the softest wood and the toughest bark of any native tree or shrub in Michigan.

LEVER-WOOD.

See iron-wood.

LILAC, COMMON—*Syringa vulgaris.*

This well known shrub exists with purple flowers. At the College, a specimen thrives southwest of College hall in the grove, also southeast of the Secretary's house. A plant with white flowers stands near and north of College hall, also in other places and in the arboretum.

LILAC, PERSIAN—*Syringa Persica.*

Two specimens stand west and within two rods of College hall. They came from the place of Prof. J. C. Holmes, who set them where they now grow.

LILAC, JOSIKA'S—*Syringa Josikæa.*

This species is no more beautiful than than those previously mentioned, but the flowers are later by three weeks or more. A specimen stands near and west of College hall. This came from Cambridge, Mass.

LINDEN.

See basswood.

LOCUST, COMMON—*Robinia Pseudoacacia.*

This tree is remarkable for its hard, durable wood, its beautiful form, and drooping racemes of fragrant white flowers. A few years ago everybody planted it by the road side and near their houses, and some planted for timber. Borers trouble the trees. It is a native of Ohio and farther south. It sprouts or suckers badly on soft ground. It puts forth leaves quite late in spring and drops them early in autumn. Look for specimens southwest and near the apiary.

LOCUST, HONEY—*Gleditschia triacanthos.*

This tree is found in rich woods in the south tier of counties, especially along the rivers Raisin and Kalamazoo. The pods are often eight inches long, an inch wide, and quite thin. The tree usually bears horrid branching thorns, but sometimes no thorns are produced. It acquires a diameter of two or more feet. It seems hardy, and if it were not for sprouting would be our most valuable plant for hedge in the coldest parts of Michigan. Notwithstanding all its faults, perhaps it is our best hedge plant.

MAGNOLIA.

See cucumber-tree.

MAIDENHAIR TREE.

See ginkgo-tree.

MAPLE, ASH-LEAVED.

See box elder.

MAPLE, BLACK—*Acer saccharinum, var. nigrum.*

This is apparently only a variety of sugar maple. The leaves are often without a sinus at the base and are minutely downy beneath. The leaves are broad dark and coarse. It is common in rich land. See a good specimen east of Williams hall, also south and a little east of the house of Dr. Kedzie. The tree is near the drive, and the one on either side of it by the drive is likewise of this variety.

MAPLE, NORWAY—*Acer platanoides.*

This is a handsome round headed tree, with broad, smooth, thin leaves. It is as hardy as the well-known sugar maple. Its foliage is more dense, its leaves appear earlier. The sap is milky, like that of the milk-weed and dandelion. It comes from Europe.

Two specimens can be seen southwest of College Hall, and east of the chemical laboratory.

MAPLE, RED—*Acer rubrum.*

This small tree thrives in wet woods. The twigs are red, as also are the flowers and fruit. In autumn its foliage is often gorgeous, some of the leaves being scarlet, others deep green, and others with clear patches of green mixed irregularly with those which are red. For autumn effect we have no tree which can excel this maple.

The wood of this tree, as of other maples, is often curly, or contains spots called bird's eye.

Specimens grow on the bank southwest of the house of the President, also in arboretum.

MAPLE, ROCK.

See sugar maple.

MAPLE, SILVER—*Acer dasycarpum.*

The leaves are silver white beneath, and are more deeply cut-lobed than are the two other species found about Lansing.

It thrives along our river banks. It succors or sends out several trunks in

the form of groups. It is of very rapid growth. The wood is fine grained and light. It is often grown in the west for timber and everywhere as an ornamental tree. A specimen may be seen southwest of Williams Hall, also in the arboretum; also along Cedar River, where it grows in great beauty and perfection, constituting one of the leading features of the vegetation on the south bank. The drooping branches hang over the water, and when moved by the wind present a fine contrast of color with the light and dark sides of their leaves.

MAPLE, SOFT.

This term is indiscriminately applied by most people who do not understand botany, to two of our native trees, the red maple and the silver maple, both of which see.

MAPLE, SUGAR—*Acer saccharinum.*

This tree is too well known to need description. It is a universal favorite with all classes. It is one of the most abundant and widely distributed trees in our State.

Many trees in the north part of the State have wood which is curly or bird's-eye. It is a prominent shade tree. The tree has tender bark and grows slowly, but the tops are compact, clean, and beautiful, in autumn assuming a bright yellow color.

A fine tree stands in the centre of the arboretum, also by the road north of the arboretum, also southwest, and also southeast of the President's house, also west of Professor Beal's house.

MAPLE, SWAMP.

See red maple.

MAPLE, SYCAMORE—*Acer Pseudo-Platanus.*

This tree comes from Europe and Asia. The leaves are large. The tree much resembles the black maple, only it is rather coarser. In England it is known as Sycamore. A specimen stands near the drive and south of the house of Professor Carpenter.

MAPLE, WHITE.

See silver maple.

MAPLE, STRIPED AND MOUNTAIN.

There are two other species of small size found in the north part of Michigan. They are very interesting. Samples are in the arboretum, as are also those of other species.

MOOSEWOOD.

See leatherwood.

MULBERRY, RED—*Morus rubra.*

This tree grows sparingly in rich woods in the southern part of the State, where it sometimes attains a diameter of two feet. The wood is yellowish, firm and durable, somewhat resembling the wood of common locust. A small

tree grows on the flats southwest of the greenhouse. In the arboretum also grow small samples of black mulberry.

NETTLE-TREE.

See hackberry.

OAK, BLACK—*Quercus coccinea, var. tinctoria.*

This is a common tree in many portions of our State. To be understood and distinguished from some other oaks, it must be studied.

Good specimens may be seen a little north and also northeast of Williams hall.

OAK, BURR—*Quercus macrocarpa.*

This becomes a large valuable tree and thrives in deep, rich, rather low land. The wood is hard, strong, and durable. Some fine trees can be seen north of the barn of Secretary Baird and west of the arboretum; also in the two west rows of the arboretum where the acorns were planted in the autumn of 1875.

OAK, CHESTNUT—*Quercus Prinus.*

This middle sized tree grows sparingly along streams. Small specimens grow along Cedar river, one south of the garden barn on the flats, one in the wild garden or rock work.

OAK, OVERCUP.

See burr-oak.

OAK—*Quercitron.*

See black-oak.

OAK, RED—*Quercus rubra.*

This tree is of rapid growth and is coarse-grained. The wood is not very durable. The wood would be fine for furniture were it not for warping and checking. For samples see one west of the chemical laboratory; also west of College hall on the bank of the brook; also about half way between Wells hall and Williams hall.

OAK, SCARLET—*Quercus coccinea.*

This is a handsome tree much resembling the black oak. The wood is of little value.

A fine specimen grows west of Williams hall and within four rods.

OAK, SWAMP-WHITE—*Quercus bicolor.*

This grows on low grounds, where it becomes a tall tree with valuable, durable timber.

For a sample see side of gravel road within half a mile west of the College.

OAK, WHITE—*Quercus alba.*

This is another very valuable tree, found in great abundance in most parts of the southern peninsula. It disappears as we go north among the forests of pine. It is one of our most valuable trees for a great many purposes; for floors, doors, and furniture, especially when cut to show the silver grain or

medullary rays. It is much used for rails, staves, posts, ties, bridges, planks and hewn timbers, piles, ship building, and many other purposes. Some of it is very tough and hard. It is the most abundant of all the oaks in this country. It grows rather slowly. Samples are abundant on the College grounds.

OAK, YELLOW BARKED.

See black oak.

OAKS.

There are several other species in the arboretum.

OSAGE ORANGE—*Maclura aurantiaca.*

This tree comes from Arkansas and Texas. It is often employed for hedges. Samples are set in a hedge due north of the farm house.

PAW PAW, COMMON—*Asimina triloba.*

This small tree is abundant in many portions of the southwestern part of the State. It is an interesting shrub of considerable beauty. It suckers freely. The fruit resembles that of a banana in some respects. A few specimens grow along the Cedar river on the north side just above field No. 5.

PEA-TREE, SIBERIAN—*Caragana arborescens.*

It is found in Northern Europe and Asia. It is somewhat ornamental. One specimen stands within a few feet of the southwest corner of College hall. This came from Cambridge by way of Dr. Gray to Dr. Thurber.

PEPPERIDGE—*Nyssa multiflora.*

This tree grows about the margins of swamps in the south part of the State. The wood is usually very difficult to split, but some of it splits easily. The limbs stand out horizontally in a peculiar manner, some like those of the beech. The leaves turn bright crimson in autumn. We are trying samples for an ornamental hedge. A small tree can be seen a little east of the south end of the car track south of Williams Hall.

PINE, AUSTRIAN—*Pinus Austriaca.*

This becomes a broad and rather large tree. The branches come out in regular whorls around the trunk like those of the white pine. The leaves hold on for several years and are of a dark green, retaining their color well in summer's heat and winter's cold.

The leaves are long, stout, and stand out in a bristling manner from the branches. On account of the above peculiarities the tree is remarkably robust and massive in appearance. It is not so suitable for cutting back as many other trees, though a little pruning generally improves its appearance. This pine is rather coarse, and therefore should not be placed near a dwelling or in the vicinity of trees and shrubs of a more delicate habit on a nicely kept lawn. It grows rapidly on almost any soil and is one of the very best for screens to ward off strong winds. Although the roots are not very thickly developed close together, adapting it to transplanting easily, still on account of its extreme hardiness and other good qualities, it is one of the best for those to plant who are not likely to take very good care of them. It comes from Austria and

vicinity. On the College grounds two trees grow east of the south end of College hall, also in a grove west of the chemical laboratory, where they may be compared with Scotch pines, which are of a lighter color and of a more delicate habit.

PINE, BANK'S.

See gray pine.

PINE, BLACK.

See gray pine.

PINE, BUCKWHEAT.

See gray pine, and perhaps white pine.

PINE, CEMBRIAN—*Pinus Cembra.*

This very beautiful and symmetrical tree comes from the Alps and surrounding country, consequently it endures our coldest winters without injury. It will grow on almost any kind of soil, but does best on a deep rich soil. Like the white pine its leaves are in clusters of five. The leaves are shorter and of a darker color; the bark is also darker, the growth much slower, the limbs much denser when compared with the tree last mentioned. Its slow growth is the greatest objection to its use as an ornamental tree, but even this peculiarity is a merit in small places or near dwellings. The fertile cones when in flavor are of a bright, purple color, and when a little older have a glaucous bloom resembling a plum. The wood is fine grained and is much used by the Swiss for carving into toys. The seeds are palatable and eaten as we eat filberts and almonds. Oil is also pressed from the seeds. A tree stands just near the northwest corner of College hall, also one about four rods southeast of the house of Professor Beal.

PINE, CROCODILE.

See gray pine.

PINE, DWARF—*Pinus pumilio.*

This tree scarcely ever attains a height of more than ten or fifteen feet. If left to itself, it generally falls over and becomes a trailing shrub, four feet high, spreading in all directions. The leaves are two or more inches long, and of a dark green color. It is perfectly hardy, and is one of the most valuable of evergreens to place in groups or in small yards, or even as a single specimen in a hollow or on a slight elevation or on the upper edge of a cliff or rock-work. With me it is a great favorite. It is a native of the Alps. A good specimen grows at the College about fifteen feet north of college hall, also in the group east of the chemical laboratory, and in numerous other places.

PINE, GRAY—*Pinus Banksiana.*

This small tree goes by a great variety of other names among the people of Michigan, such as scrub, black, crocodile, Jack, buckwheat, etc. It is a scrubby bush or small tree, though it often becomes fifty or even eighty feet high, and fifteen inches in diameter. It grows in poor sandy soil. It is rather more slender and graceful than the Austrian pine, which it somewhat resembles. The leaves are short and of a dark color. The grey pine is not often

planted, but I see no reason why it should not find a place on every well-kept lawn. Small trees can be seen in the arboretum.

PINE, JACK.

See gray pine.

PINE, MOUNTAIN.

See dwarf pine.

PINE, NORWAY.

See red pine.

PINE, RED—*Pinus resinosa*.

In this State where this tree is very common and grows to great perfection, the lumbermen nearly all call it Norway pine. This is an unfortunate name, as it does not grow in Norway. It sometimes becomes a very tall, straight tree, two feet or more in diameter. The bark is red and rather smooth, the leaves are about five inches long, of a dark green color and borne in bunches at the end of the branches. The color of the trunk and the long leaves make it a tree of peculiar appearance. It is not very common in cultivation, probably because the nurserymen cannot easily get seeds. Young trees taken from their native soil are very likely to die. In my opinion it is a more beautiful tree than the Scotch pine and more beautiful than many others which are often used for ornamental purposes. Small specimens grow in the Arboretum.

PINE, SCOTCH—*Pinus sylvestris*.

While young, this may be compared with the Austrian pine. It is less robust or more delicate in appearance. The leaves are more slender and of a lighter color. It is very common in cultivation as an ornamental tree in this country. It bears transplanting well, grows in any soil, the seeds are easily obtained and the tree is very hardy, all of which recommend it for general cultivation. In Europe it holds much the same position as a forest tree, that white pine does with us, though the tree is far inferior to white pine as a timber tree. The lumber is called red or yellow deal. At the College good specimens are to be found with Austrian pines west of the Chemical Laboratory and north of the greenhouse, also a three-pronged tree north of the big stone in the grove. The trunk of this as well as that of the Austrian pine is very apt to be injured by one kind of sap-sucker. Mr. Bryant in his "Forest Trees" says: "The only preventive appears to be powder and shot."

PINE, SCRUB.

See gray pine.

PINE, STONE.

See cembrian pine.

PINE, SWISS.

See cembrian pine.

PINE, WEYMOUTH.

See white pine.

PINE, WHITE—*Pinus Strobus*.

The same tree is known as Weymouth pine in Europe. This majestic tree is too well known by many of our people to need an introduction from me. To

show off to best advantage it needs considerable room. No evergreen will make a screen quicker than the white pine. The bark on young trees is remarkably smooth and free from cracks until about twenty years old. As the leaves only hang on for two summers they are all on young limbs, which is quite likely to make the tree appear thin, especially if it grows rapidly. The lower limbs generally die or remain shorter than those above them unless the tree is trimmed or cut back. It bears cutting well and is improved by a judicious use of the knife. Young, thrifty trees are extremely beautiful on account of their smooth bark, their long, soft, slender leaves, which are of a light glaucous color. It is very graceful and holds a high rank as an ornamental tree for its many good qualities. This is the only native tree of the State which has its leaves in clusters of five. As a back ground it serves as an excellent contrast for some smaller, darker evergreens. It mixes well with deciduous leaved trees, but the young branches will be rubbed off if allowed to touch other trees. The white pine is one of our most hardy trees and thrives in a great variety of soils, even extending into swamps in many places. The slightest stir of air easily moves the long delicate leaves, producing "a constant sighing and moaning like the gentle beating of waves upon a distant shore." The white pine is abundant in the native forest of Canada and the Northern States, especially in Michigan. It is the great source of nearly all of our pine lumber so well known all over this country and in Europe. Some of the trees grow seven or eight feet in diameter and over two hundred feet high. At the College a fine tree stands west of Professor Beal's house. This grew naturally on the river bank of the farm and was taken up and planted by President Abbot about the year 1866, for and in the name of his daughter Mary. It has been trimmed or cut back occasionally. Another specimen grows a few rods east of the same house, also two more south of the front door of Dr. Kedzie's house. There are numerous other species of pine in the arboretum, all of which are quite young and small.

PLANE TREE.

See buttonwood.

PLUM, CHICKASAW, RED, WILD, YELLOW.

For samples see arboretum.

POPLAR, LOMBARDY—*Populus dilatata.*

This well-known stiff spiry tree comes from Europe.

It grows very fast but soon dies, at least some portions of each tree, producing a dilapidated appearance. It is well that it is not much planted.

A single small specimen stands in the grove southwest of College Hall.

POPLAR, SILVER.

See white poplar.

POPLAR, WHITE—*Populus alba.*

This rapid growing tree comes from Europe.

It spreads badly by the roots. It is not a favorite in well-kept places. One specimen can be seen east of the chemical laboratory.

POPLAR, WEEPING CUT-LEAVED.

See aspen, large toothed.

SASSAFRAS—*Sassafras officinale.*

This is well-known, usually as a shrub, but occasionally a tree two feet or more in diameter. The wood is beautiful and durable. The tree is rather tender in most parts of Michigan. A tree stands west of Williams' Hall within a few rods, also, in the grove south of College Hall.

SAVIN—*Juniperus Sabina.*

This is a low trailing or spreading hardy evergreen shrub, with limbs and leaves much resembling those of red cedar. It is valuable about rock work, on knolls or in or near groups of other trees. It may be easily trimmed and kept in almost any shape. It grows in the northern United States and in northern Europe and Asia. At the College are good specimens, one west of the greenhouse, also one north of the greenhouse, also southeast of the house of Professor Beal.

SERVICE-BERRY.

See June-berry.

SHAD-BUSH.

See June-berry.

SHRUBBY TREFOIL.

See hop-tree.

SMOKE TREE—*Rhus Cotinus.*

This shrub comes from the Southern States. It is common in cultivation under the above name, but more often under the name of fringe tree. The latter name should be reserved for another plant. The flower clusters often lengthen and become large, light, feathery or cloud-like bunches, either greenish or tinged with red. These are quite ornamental. An old shrub grows in the grove by the big stone where it was set by Professor Holmes.

SNOWBALL—*Viburnum Opulus.*

This shrub is common in cultivation. The balls are composed of neutral flowers. The original of this plant grows wild in our swamps, where it is known as high cranberry-bush, or bush-cranberry.

Specimens can be seen northwest of college hall, not far from the rustic foot-bridge; also south of Prof. Cook's house.

SPRUCE, BLACK—*Abies nigra.*

This is a small, conical tree, with limbs extending in graceful sweep much like those of the Norway spruce, only not on so grand a scale. It grows abundantly in the swamps of this State at Lansing and northward, sometimes attaining a diameter of two feet. The young trees are beautiful, but most old trees become irregular and scraggy.

A small, poor specimen grows several rods east of Williams hall.

SPRUCE, HEMLOCK—*Abies Canadensis.*

This tree is distinguished for its delicate light green spray of graceful drooping habit, often rendered more drooping by large numbers of small cones at the ends of the small limbs. When seen from the under side, the leaves are much lighter in color, a glaucous green. It is generally called hardy,

though it is quite likely to be injured when placed where it is exposed to the strong cold winds of winter. This is especially true of young trees when not protected by trees, hills, buildings or some artificial screens. It is not a tree for swamps, neither will it thrive in very dry situations. It prefers a deep loam in a cool situation. It bears the shears well and is a great favorite for screens and ornamental hedges. S. B. Parsons, than whom no one ought to be better able to judge, says: "It is safe to assert that this is the most beautiful coniferous hardy tree yet known." Josiah Hoops says: "Were I restricted to one tree, I would far rather have a specimen of the hemlock spruce than all the Deodras and Cryptomerias ever introduced." Meehan says: "It would not be exaggeration to pronounce this the most beautiful evergreen in cultivation." It appears more charming in spring when the light color of the young buds are in sharp contrast with the older leaves of darker color. Its timber is of little value except as roof boards, scantling, or frames for buildings, where it answers a very good purpose. The bark is valuable for tanning. It is a native of Canada and the northern United States, in many portions of which it is a very common tree, often of great size. It sometimes forms vast forests, though more frequently it is mixed with pines, maples, beeches and other trees. No large specimens are found on the College grounds, but some of the best small ones are north of the greenhouse.

SPRUCE NORWAY—*Abies excelsa.*

For planting in Michigan and most other northern States, this is the most used of any evergreen. It is well worthy of this leading position as an ornamental tree. It heads the list because it bears transplanting so well, because of its beauty and the rapidity of its growth. It is perfectly hardy and bears trimming into any shape for hedges or for single specimens. For ornamental hedges and especially for large sheltering screens it is the best tree we have. For ornamental purposes, the lower limbs should be left to grow and recline upon the ground. Once cut off close to the trunk they will not be reproduced. Old specimens in good soil with plenty of room exhibit peculiar beauty in the graceful curves of the longer limbs from which droop the smaller feathery branches. Downing says: "As a park tree to stand alone, we scarcely know a more beautiful one."

There is a remarkable difference in trees growing in the same nursery row, started from the same lot of seed. There are many named varieties, but of those not named, some are stout dark green with dense growth of limbs, others are much lighter with fewer limbs and a much more graceful and slender habit. In spring when the young shoots have put forth for a few inches, they are strikingly beautiful on account of their drooping habit and light color which is in deep contrast with the darker color of the older leaves. The young red cones are beautiful. This tree is too often planted near the house or in crowded groups, the owner of the place forgetting that it is destined to become a tall, broad tree. As a consequence, it is much injured or has to be removed in a few years. The timber is said to be more durable than that of our white pine, quite like it and used for similar purposes. For general use as an ornamental tree we have no evergreen to compare with the Norway spruce. "Neither sun nor cold, drought nor moisture seems to affect it, and it is a tree which will always give satisfaction." It is a native of northern Europe and Asia, and extends farther south on the mountains where it becomes one of the largest and tallest of trees. It is the most common evergreen on the College grounds. A very slen-

der specimen with delicate drooping branches is placed a few rods east of the south end of the College Hall, where it is in marked contrast with two others of much stouter form. These were selected and planted by W. W. Tracy, a former professor at the College. One of the finest of the large specimens on the grounds is northeast of Professor Beal's house near the posts in the foot path. This tree is conspicuous for its symmetry and well developed lower branches.

SPRUCE, ORIENTAL—*Abies orientalis.*

This tree seems to be as hardy as a Norway spruce, which it somewhat resembles. The leaves are shorter than those of that species. The whole aspect is much like that of a refined, slow-growing Norway spruce. It is not as common in cultivation as it deserves to be, especially in our trying climate where we are compelled to discard so many trees which are choice for ornamental purposes in milder winters than we are certain of in central Michigan. A single specimen grows a few feet northwest of College hall where it was planted by Dr. Thurber, a former professor at the College.

SPRUCE, WHITE—*Abies alba.*

This is a small evergreen tree with compact growth of regular conical outline. The leaves are glaucous green in color, often approaching to a bluish tint, although the leaves and branches on close inspection appear a little stiff, this is not so apparent at a little distance. It is a slower grower and more compact in form than the Norway spruce. On account of the light color, it forms a good contrast with the dark foliage of the Norway spruce. The branches of old trees will become thin and bare unless cut back or kept growing on good land. It grows in the northern States, sparingly in northern Michigan. The leaves are longer, of a lighter color, the cones larger and the tree a more rapid grower, and altogether it is a more beautiful tree than the black spruce.

There are several other species of spruces growing in the nursery at the College.

SOUR-GUM TREE.

See pepperidge.

SUGAR-BERRY.

See hackberry.

SUMACH, POISON—*Rhus venenata.*

This beautiful shrub grows in our swamps. It is one of the plants of our State which is poisonous to the touch. I am glad to say we have no specimens about the College grounds, although there may still be a few specimens in the swamps on the back part of the farm. I will add that a specimen has been planted and labelled on a small island in the pond of the wild garden.

SUMACH, STAGHORN—*Rhus typhina.*

This large shrub is distinguished for the brilliant red color of its primate leaves and its red fruit in autumn. It suckers badly on soft ground. A specimen grows a few rods southwest of the Secretary's house; also on the river bank near the west entrance to the grounds.

SWEET-GUM TREE.

See gum tree.

SYCAMORE.

See buttonwood, also maple sycamore.

TAMARACK.

See larch, American.

TULIP-TREE—*Liriodendron tulipifera.*

This tree is truly noble and magnificent. In the southern part of the State it becomes one of the largest of trees. It has been well thinned out for its lumber, which is much used in place of white pine. In the south it is often called poplar, a name which ought to be reserved for several other trees of the genus *populus.* It makes a fine ornamental tree where it is well grown. It is rather difficult to transplant. The seeds start rather slowly.

The finest native tree on the College grounds is a tulip-tree. It stands northwest of Williams hall and near the well, also smaller trees southwest of the same hall, also between the houses of Professors Kedzie and Fairchild, also west of College hall a few rods, and in numerous other places.

TUPELO.

See pepperidge.

VIRGILIA.

See yellow-wood.

VIRGINIA CREEPER—*Ampelopsis quinquefolia.*

This is our most beautiful hardy native climber. It will run up the sides of a brick wall or board house without any nails or strings to support it, provided the loose ends be kept cut off to prevent the wind from blowing it down. Such a specimen can be seen on the east side and on the west side of the President's house, also on the south side of Professor Fairchild's house, and a loosely hanging vine on the west side of the house of Professor Beal; also some are planted by trees on the lawn west of College Hall and north of the chemical laboratory.

WALNUT, BLACK—*Juglans nigra.*

This is the most valuable kind of forest tree in Michigan. It is not particularly fine as an ornamental tree. Very large specimens once grew quite abundantly in the southern portion of the State. The timber is too well known as valuable for furniture and finishing the interior of houses to need description. The black walnut is a "bad neighbor to many other trees" as the apple, sugar maple, etc. It is one of our most promising trees to grow for timber.

A specimen stands on the flats just below the stone culvert south of the house of Professor Carpenter, also in the arboretum.

WHITE WOOD.

See tulip tree.

WILLOW, WHITE—*Salix alba, var. vitellina.*

This rapid growing willow comes from Europe. It has nothing of much importance to recommend. Specimens grow, one near the College well, also by the rustic foot bridge, also north east of the trees last named.

WILLOW, BLACK—*Salix nigra.*

This is the largest native willow in this vicinity. A sample grows northeast of Prof. Beal's house, also along the river banks.

WISTARIA, CHINESE—*Wistaria Sinensis.*

This beautiful vine comes from China. It is not quite hardy at this place. A specimen grows by the rustic house near the big stone.

YELLOW-WOOD—*Cladrastis tinctoria.*

This graceful tree thrives in the forests of Kentucky and vicinity. It appears to be perfectly hardy in exposed places during our coldest winters. The bark is smooth, much resembling the beech. The leaves and flowers somewhat resemble the common locust, to which the plant is nearly allied. The flowers are showy, white, and hang in long clusters among the pinnate leaves. For small places or for large ones, I know of no more appropriate deciduous tree. It deserves much more attention than it generally receives, although it stands very highly recommended by our best nurserymen.

YEW, AMERICAN—*Taxus bacata, var. Canadensis.*

This is abundant in the forests of northern Michigan, where it is a trailing shrub commonly called ground hemlock. It has beautiful dark green foliage somewhat larger and coarser, though resembling the hemlock spruce. It likes damp, shady places. It becomes dull color in winter. It bears trimming into any shape. There are none on the College grounds.

REPORT OF THE HORTICULTURAL DEPARTMENT.

August 31, 1878.

To the President of the Agricultural College:

I herewith submit the report of work under my charge for the year ending August 31, 1878.

Commencing my duties the first of last March I could not carry on the work of the department so well as I hope to do hereafter. I am under great obligations to Professor Beal for many suggestions in regard to all matters pertaining to my duties.

As it had been planned to remove the vegetable garden to the east side of No. 2, and that not being in readiness for garden crops, only enough vegetables to supply the boarding hall and families on the College grounds were planted. The strawberries wintered well and gave promise of a large yield, but an exceedingly heavy frost occurring just as they were in full bloom destroyed at least three-fourths of the crop, so that the yield was but six and one-half bushels off from a little over one quarter of an acre. The vegetable garden has furnished a full supply of vegetables for the boarding hall all through the season.

I am well pleased with the plan introduced by Professor Beal of giving students of the senior class charge of special kinds of labor. The students who have the special assignments are interested in their labor and work with a will. They learn to do one thing well, and I find that they take more interest in other kinds of labor, and have a better general idea of the working system of the department than those students who are being constantly changed from

one occupation to another. They also get some valuable experience in the practical management of workmen.

It is also a great help to the labor in the department, as it relieves the officer in charge from looking after many details, and allows a better opportunity to have supervision of all the work in progress during the afternoon.

STUDENTS' LABOR.

Labor performed outside of the department for which we have cash credit	6,501½	hrs.
Labor performed in department	8,518½	"
Total hours	15,020	

The account is as follows:

6,501½ hours' labor @ 10 cents	$650 15
8,518½ hours' labor @ 09.89+	843 15
15,020 hours' labor	$1,493 30

The 8,518½ hours in department cost $843.15, and has been charged as follows:

Grounds	$112 27
Vegetable Garden	171 41
Greenhouse and Flower beds	127 48
Orchard	97 09
Nursery	61 74
Vineyard	36 08
Strawberries	20 20
Raspberries	12 34
New Vegetable Garden (permanent improvements)	6 43
Experimental plats of potatoes	15 76
Experimental plats of corn	17 75
Pear orchard	7 50
Tools (care of, repairs)	67 55
Office (posting books, copying, etc.)	8 08
Compost	35 90
Team	1 61
Experiments (under Prof. Beal)	43 96
	$843 15

MEN AND TEAM LABOR.

Labor bills for men	$272 46
Board of men	143 28
Feed for team and repairs for harness, etc.	292 30
	$708 04

This labor has been charged to the various accounts at 25 cents per hour for man and team, and (7) seven cents per hour for labor of a single horse.

The account is as follows:

Amount received for labor outside of the department	$342 13
Labor charged to department	456 67
Total	$798 80

Showing a balance of $90.76 in favor of the labor account for the year. The men and team labor has been charged to the department as follows:

Grounds	$110 00
Vegetable Garden	64 19
Orchard	67 19
Pear orchard	6 50
Nursery	1 73
Vineyard	10 09
Strawberries	3 74
Raspberries	5 56
Experimental corn	8 09
Experimental potatoes	20 64
New Garden, permanent improvements	7 59
Compost Heap	146 85
Shop (drawing lumber)	1 25
Team	3 25
	$456 67

VEGETABLE GARDEN.

The larger part of the garden was planted on poor soil, as much of the surface had been drawn off to fill up low spots on the lawns: for this reason, it was heavily manured to leave the land in condition to seed to lawn next spring. One-half only of the value of the manure was therefore charged to vegetables. The account is as follows:

	Dr.	Cr.
To labor on crops	$235 60	
200 loads of compost @ .75	150 00	
raspberry plants	8 70	
hellebore	1 50	
Paris green	5 60	
seeds	16 44	
seed potatoes	6 00	
barrels	24 90	
By cash for vegetables sold		$225 91
vegetables on hand		200 00
Paris green sold		3 40
barrels on hand		4 00
compost left in ground		75 00
To gain to balance	59 57	
	$508 31	$508 31

Having taken some pains to find out what, and how many vegetables are used in Lansing, I find the larger part are sent in from other places. I am well satisfied that by having a constant supply of vegetables put up in good shape and delivered fresh in town every day, we may increase our garden to a large extent, furnish profitable labor to the increasing number of students, and afford valuable practical instruction in the growing of vegetables.

As we shall have a sufficient extent of suitable land for this purpose the coming year, we only need a market wagon for delivering stuff, and a suitable building for storing vegetables, with a cellar to keep apples, potatoes, squashes, &c., into the winter and spring months, when they can be marketed with greater profit.

INJURIOUS INSECTS.

Insects injurious to plants were numerous as usual, and destroyed all our earliest radishes and cabbages. The small striped cucumber beetle attacked our melons, cucumbers and squashes in swarms, but light sprinklings of air slaked lime on the vines, and gas lime scattered around the hills seemed to keep them off so that little damage was done. Our cabbages were infested early in the season with the latest and worst scourge of the garden—the larvæ of the cabbage butterfly. I commenced at once trying all the remedies I could hear of, applications of carbolic acid, ammonia, fine middlings, salt, cayenne pepper, tar water, and several other things, proved almost worthless, but a suds made of whale oil soap and soft water applied as often as the ravages of the larvæ began to show, was quite effectual. We also tried planting a patch of cabbage at a distance from where they had been grown before, thinking that possibly they would not be found. At first it seemed a success, but by the latter part of July the butterflies were swarming over the patch. An occasional sprinkling of the whale oil soap suds was an effectual remedy, and but few of the cabbage heads show the marks of the larvæ.

I found the best method of application was to place a barrel of water in the field and add two pounds of the soap, it would dissolve and be ready for use after a day or two. The longer it stands the more disagreeable it smells, and its effect on the worms more rapid. We applied it with a common watering can, with a fine nose, just enough to wet over the surface of the leaves. It can not be detected either by taste or smell if the suds is not applied for a week or ten days before the cabbages are harvested. From other experiments made at the College this year, and from what I have heard of its use at other places, I think this soap will prove to be one of the best insecticides known. We shall experiment very thoroughly with it next season.

Our melons, planted on the poorest of soil, yielded abundantly. The method of cultivation was as follows:

After the land was plowed and harrowed, two or three shovelsful of old rotten compost were thrown down where each hill was to be, and thoroughly forked in over a surface three or four feet square. Eight or ten seeds were then dropped at the center of the place forked over, and covered with half an inch of fine soil, the ground being left level. A small box without top or bottom, eight inches square on the bottom, eight inches deep, with the sides flaring out so as to be ten inches square on top, was placed over the seeds; dirt was then drawn up around the box with a hoe and packed down firm, four inches high; the box was then carefully lifted out and carried to the next hill, and the operation repeated. This leaves a bank of earth around each hill, and

by laying on a pane of glass each hill is a minature cold frame. After the plants were well started and began to touch the glass, the hills were leveled down, and the plants thinned to three in number.

Melons, squashes, and cucumbers may be planted earlier by this method as they will be protected from late frosts, while the additional warmth produced will cause them to grow rapidly. It also protects from insects when the plants first come up. In using glass in this way, the glass must be partly removed on bright, warm, sunny days, after the plants are up, or they will be scorched; they should also be taken off during showers.

EXPERIMENTS.

During the year we have been carrying on a series of experiments in root pruning, corn, and potatoes. The theory is strongly recommended by Dr. C. L. Sturtevant, of Massachusetts, who reports remarkable results from the practice. We have also experimented on potatoes planted at different depths, on the proportion of eyes that grow on whole and cut potatoes, and on the amount produced per acre from different quantities of seed. As these experiments are not complete at this date, they will appear in another part of this report.

F. A. GULLEY.

DEPARTMENT OF ENGINEERING AND MATHEMATICS.

To President Abbot:

I have the pleasure of submitting the following report of the Department of Engineering and Mathematics, from the first of October, 1877, to the thirty-first of August, 1878.

CIVIL ENGINEERING.

Civil engineering was taught the last term of the school year of 1877 to the senior class of that year. Trautwine's work on civil engineering was used as a text-book on such subjects in our course as were treated of. From the text-book instruction was afforded the class on the subjects relating to, 1st, preparation of foundations; 2d, preparation and use of morters, limes and cements; 3d, strength of materials; 4th, construction of frames; 5th, bridge, truss and roof building.

In order to connect the course more intimately with agriculture, lectures were given the class on the subjects of, 1st, architectural orders and farm architecture; 2d, principles of machinery, and use and care of farm machinery; 3d, construction and care of common roads.

This course, embracing as it does such a variety of subjects, on nearly any one of which a term's work could profitably be spent, is of necessity rudimentary and general in its character.

ASTRONOMY.

Astronomy was taught six weeks during the third term of 1877 to the junior class of that year, consisting of 28 members. The class exhibited a great deal

of enthusiasm both in their class recitations and in their evening work of observing planets and constellations. The class passed completely through their text book, White's Astronomy, and did much to fix the names of the constellations. Our means of illustration in this study are very meager and consist entirely of borrowed apparatus, viz.: a small telescope and a celestial globe. A good telescope, properly mounted, is needed very much.

INDUSTRIAL DRAWING.

Drawing was taught the last half of the first term of the school year of 1878 to the junior class, consisting of 25 members. Minifie's Mechanical Drawing was used as a text-book, and each student was required to draw on Whatman's paper ten plates of uniform size, finished in India ink. The course embraced the principles of projection, isometric and perspective drawing, and the plates consisted of title page and examples under the heads enumerated above. Considerable disadvantage is experienced in the study of drawing from the fact that there is no room in the College fitted with desks so that the students can draw under supervision of the teacher. The drawing was done almost entirely in the private rooms of the students, although the class was divided into three sections, one of which drew one hour each day under my supervision. The manner in which the work in drawing was performed was highly creditable to the class.

MECHANICAL PHYSICS.

This course is a continuation of the course in mechanics and embraces the principles of hydrostatics, hydraulics, acoustics and optics. It was taught to the junior class the first half of the first term of 1878.

Snell's Olmstead's Philosophy was used as a text book. The class passed over the whole course in a satisfactory manner. Instruments for illustration in this study are urgently needed.

GEOMETRY AND ALGEBRA.

The course in Geometry extends over two terms, the last term in the Freshman year, and the first term in the Sophomore year. That portion belonging to the Freshman year has been pursued by the class, and consisted of all that portion of Olney's Geometry preceding the section on equivalency. The class studying geometry consisted of 92 students; in order to afford each student a better opportunity, this class was divided into three sections, each of which had one recitation per day.

Algebra was taught the first and second terms of the Freshman year, that is, the last term in the school year of 1877, and the first term in the school year of 1878. The total number of students who pursued Algebra, as shown by my class book during the past year, is 122. The class passed entirely through the first and second parts of Olney's University Algebra, and also the parts relating to differentiation and the solution of higher equations. The course is not sufficiently long to embrace the subject of probabilities and several other subjects important to the scientific student. Because a large proportion of our students, when they enter, are acquainted with the elements of Algebra, it is thought that a short course in algebra soon can be required as a qualification for admission.

RHETORICALS.

During the first two terms of 1878, I met the Freshman class for rhetorical exercises in two divisions each Saturday forenoon. These exercises consisted

of essays and declamations, and in every case were highly creditable to the class. These exercises increased my work very much as the labor of correcting essays occupied a great many hours each week.

LECTURES.

I prepared and delivered two lectures before the Farmers' Institutes held at Saginaw and at Climax; the subject of that delivered at Saginaw was Farm Drainage, at Climax, Use of Steam in Agriculture. Both of these lectures are printed in full in the Report for 1877.

I have also prepared and delivered two lectures before the students, one on the subject of the Planet Mars, the other in regard to the Improvement of the Mouth of the Mississippi River.

ENGINEERING WORK OUTSIDE OF CLASS ROOM.

Brick Oven.

At the request of Hon. H. G. Wells, President of the State Board of Agriculture, I took charge of the construction of the brick oven, which was authorized by the Board at their meeting in the spring of 1878, and was built in August. The oven is directly south and adjoins the kitchen in the College boarding hall. Externally it is twelve feet square and seven feet two inches high. It stands on a foundation of concrete a little larger than the oven, and about twelve inches in depth. Directly on the foundation and $2\frac{1}{3}$ feet high, is a stone wall eighteen inches thick, stone for this wall being obtained from the ruins of the hall burned in 1876.

On this wall is built a 16-inch brick wall which constitutes the sides and ends of the oven. One and one half feet above the stone work is the floor of the oven. The space enclosed by the walls and below the floor is filled with sand, broken brick, and other indestructible rubbish obtained from the ruins of the burned hall; this is thoroughly rammed and supports the floor of the oven. The oven arch was turned on a sand center and is composed of two layers of bricks, "grouted in," in order to expose as little mortar to the action of the fire as possible.

The oven flue is connected with a chimney of the boarding hall, and is regulated by a heavy turning damper, it being impossible to put in a sliding damper on account of the peculiar shape of the chimney. The interior dimensions of the oven are $9\frac{1}{2}$ feet by $10\frac{1}{2}$ feet, its hight at the center is twenty-two inches, and at the springing of the arch six inches. The arch is held firmly in place by eight iron rods, four of which pass above the crown and four below the floor of the oven. The ends of these rods pass through horizontal plank and vertical posts outside of the oven, and are held in place by burrs.

The arch and floor being constructed of ordinary brick cannot reasonably be expected to stand more than three or four years, but the oven is so constructed that they can be replaced with little expense when burned out, by which time it is hoped that a fire-brick arch and floor can be afforded.

The total cost of the oven to the College was $74.54.

Pipe Dies.

In accordance with a resolution of the Board I procured two pipe dies and one pair of pipe tongs for the steam works in the hall at a cost of $10.34.

Zincing the Ceiling of Engine Room in Williams Hall.

In accordance with a resolution of the Board, the lathing was removed from the ceiling over the boilers in Williams Hall, and zinc put in its place to protect the building from fire. This work was done by the engineer, Mr. George Burdick, assisted by students. Its total cost to the College was $20.44.

Steam Pump in Williams Hall.

Since lowering the steam pump three feet as described in the Report for 1877, it has done satisfactory work. The total cost of repairs has been $2.00, which was for replaning the valve seats as authorized by the Board. Its capacity is about twenty-five barrels per hour, although this to a great extent depends upon the depth of the river. The pump in its present position is about 23 feet above the bottom of the river, and 21.44 feet above the check valve in the inlet pipe near the river. To raise the water 1.44 feet we have depended upon a dam of loose stone. This was not sufficient, however, and during the lowest stages of water no pumping could be done. We are now replacing this dam with a more substantial one as shown in another portion of the report. The steam pump is 804 feet distant horizontally from the river. It lifts water by suction about 21.5 feet (depending on the depth of water in the river), and forces the water to the top of the tank in Williams hall, 61.19 feet farther, making a total lift of 82.7 feet vertically, and 804 horizontally. The bottom of this tank is 19 feet above the upper floor in Wells hall, and 39.63 feet above the bottom of the wind mill tank at the greenhouse. The capacity of the tank is 37 barrels.

Because of the uncertain and limited supply of water at the greenhouse it has been proposed to connect the pipe recently laid from the water tank in Williams hall to Wells hall with the greenhouse water pipes. The estimated cost of such connection would be:

397 feet of inch pipe	$39 70
Extra valves and cost of laying	10 30
Total cost	$50 00

Water Pipe Connecting Williams and Wells Hall.

The bottom of the water tank in Williams hall is 49.4 feet above the lower water table and 19 feet above the level of the upper floor of Wells hall. The steam pump is so connected as to pump directly into the tank in Williams hall, which holds 37 barrels. It was seen that by connecting this tank with Wells hall there would be head sufficient not only to supply the boilers in the basement with water, but to raise the water to the various floors in the building, thus providing a cheap and efficient water supply for Wells hall. The pipe which was laid in 1872 between the Laboratory and the boilers of Williams hall for supplying the Laboratory with steam, being no longer used was taken up, a trench between the two halls was dug and the pipe laid in this position. The old pipe not being quite long enough, 75 feet of new pipe were obtained: also two new valves and several couplings, the cost of which was assumed by the boarding hall. In the valley between the two halls was placed a drip valve, so that the water could be emptied from the pipe if necessary.

The total cost to the College of this improvement was $19.25 for students' labor in taking up and relaying pipe. For want of means the supply pipe was not carried above the basement of Wells hall, but a valve was put in the

pipe where it leaves the ground near the boiler room, and a convenient place for getting water outside of the building was prepared. Should the Board think it desirable to supply each floor in the various sections of Wells hall with water, the cost will be approximately as follows:

330 feet of inch water pipe	$33 00
Cost of putting in the same	17 00
Total cost	$50 00

These figures are doubtless high enough to include the cost of all extras which may arise, such as carpenter work, drip pipes, drip basins, faucets, etc.

Dam across the Red Cedar River.

It was found impossible for the pump to obtain a supply of water, when the river was low, as previously stated. The pump, although as low as possible in its present position, is twenty-three feet above the water in the river at its lowest stages, which at some times does not even cover the outlet of the supply-pipe.

To remedy this there seemed no practical method except to build a low dam across the river. Several years ago a dam of loose stones was constructed about 18 inches high. This dam has been kept in existence by relaying the stones each year, which were invariably rolled out of place at the next flood. This system of annual repairs being so costly, it was thought advisable to form some sort of a permanent dam. After examining the dams in the vicinity, it was decided that a dam constructed of piles, brush, and stone could be built stronger and cheaper than any other style of dam.

Finding that it would be impossible to hire piles driven for less than $5.00 per pile, an amount that we could not afford, I designed and had a pile driver constructed whose cost was as follows:

For casting hammer 360 pounds	$10 00
For building ways	6 08
For making shears	2 00
Total	$18 08

Although at the date of this report the work on the dam has not been completed, yet a sufficient number of piles have been driven to allow us to form a correct estimate of the cost of piling. The actual cost of driving has averaged for the piles already driven $1.25 per pile. It is thought that the dam will be finished during the months of September and October, although should the water of the river rise very much the completion of this work will have to be postponed until the summer of 1879.

Surveys.

The west line of the farm has been surveyed and short pieces of iron water pipes have been put in the ground at the various corners established. This way of marking corners is not without objection, but iron pipes are certainly preferable to wooden stakes, and we had no means for purchasing more permanent monuments. The survey of the east line of the farm north of field No. 9 has been nearly completed and will probably be finished before the third term of school closes.

Drains have been located and surveyed at the request of the farm department in fields No. 9 and No. 2. The drains previously located are shown on the map published in the annual catalogue and in the Report for 1877.

It is the intention to survey the whole farm as soon as possible, but the past year so many other duties required my immediate attention that no opportunity presented itself even for commencing this work.

LATITUDE AND LONGITUDE.

During the year some observations and surveys have been made, with the view of determining the latitude and longitude of College hall. The latitude and longitude of the dome of the Capitol was found by engineers in the U. S. army, with excellent instruments, in 1875. With the instruments belonging to the College very accurate work is impossible, and the results here given are liable to a probable error of about one second of arc.

The result of our survey is as follows:

Agricultural College.

Latitude.	Longitude W. of Greenwich.	Longitude W. of Washington.
42° 43′ 54.23″	84° 29′ 00.60″	7° 25′ 54.80″

Time at the Agricultural College is 5h. 37m. 56.04s. behind Greenwich time, 0h. 29m. 43.66s. behind Washington time, and 17.504s. ahead of Lansing (dome of Capitol) time.

The latitude and longitude of the various places given below are compiled with a few exceptions from the United States engineer's report for 1875, 1876, and 1877. In each case, unless otherwise specified, the longitude and latitude given is of the astronomical post which was set in the town by the U. S. engineers.

TOWN.	Latitude.	Longitude West of Greenwich.	Longitude West of Washington.
Detroit	*42° 20′	‡83° 03′ 03.60″	5° 59′ 57.80″
†Ann Arbor	42° 16′ 48″	83° 43′ 45.80″	6° 40′ 40″
Pontiac	42° 38′ 07.20″	83° 17′ 20.85″	6° 14′ 15.05″
Lapeer	43° 03′ 07.61″	83° 18′ 54.90″	6° 15′ 49.10″
Flint	43° 01′ 13.02″	83° 41′ 06.75″	6° 38′ 00.95″
St. Johns	42° 59′ 59.94″	84° 33′ 37.35″	7° 30′ 31.55″
Ionia	42° 58′ 52.53″	85° 03′ 49.20″	8° 00′ 43.40″
Grand Rapids	42° 57′ 49.02″	85° 40′ 01.65″	8° 36′ 56.85″
Corunna	42° 58′ 22.23″	84° 07′ 04.56″	7° 03′ 58.76″
Howell	42° 36′ 00.24″	83° 55′ 44.25″	6° 52′ 38.45″
Lansing	42° 43′ 53.11″	84° 33′ 19.68″	7° 30′ 13.88″
Hastings	42° 38′ 52.85″	85° 17′ 18.25″	8° 14′ 12.45″
Jackson	42° 14′ 51.02″	84° 24′ 31.86″	7° 21′ 26.06″
Allegan	42° 31′ 43.01″	85° 51′ 08.77″	8° 48′ 02.97″
Newaygo	43° 25′ 14.16″	85° 48′ 03.78″	8° 44′ 57.98″
Charlotte	42° 34′ 04.12″	84° 50′ 01.46″	7° 46′ 55.66″
Marshall	42° 16′ 21.21″	84° 57′ 49.11″	7° 54′ 43.31″
Kalamazoo	42° 17′ 25.83″	85° 35′ 05.60″	8° 31′ 59.80″
Paw Paw	42° 13′ 02.41″	85° 53′ 04.94″	8° 49′ 59.14″
Stanton	43° 17′ 29.74″	85° 04′ 58.80″	8° 01′ 53″
†Chicago, Illinois (Observatory)	41° 50′ 01″	87° 36′ 39.70″	10° 33′ 33.09″

*From coast survey report. | †From Nautical Almanac. | ‡From U. S. Engineer's Report.

Lansing City.

POINT.	Latitude.	Longitude West of Greenwich.	Longitude West of Washington.
Astronomical post	42° 43′ 53.11″	84° 33′ 19.68″	7° 30′ 13.88″
Dome of Capitol	42° 43′ 56.06″	84° 33′ 23.17″	7° 30′ 17.37″
N. E. corner of section 16	42° 44′ 21.87″	84° 32′ 37.36″	7° 30′ 31.56″
Intersection of axes of Capitol and Michigan avenues	42° 43′ 55.79″	84° 33′ 16.98″	7° 30′ 11.18″

On the supposition that the longitude of Washington is 77° 03′ 05.80″ west of Greenwich, the last column in the foregoing table was computed.

This is the longitude of Washington commonly used in all computations, but the most recent determinations of the coast survey make the longitude of Washington 4.05″ less than the value given above.

In accordance with these values Lansing time (dome of capital) is 5h. 38m. 13.54s. behind Greenwich time, 0h. 30m. 01.16s. behind Washington time, 6m. 01.07s. behind Detroit time (lake survey observatory), 12m. 13.10s. ahead of Chicago time, and 3m. 18.49s. behind Ann Arbor time.

ELEVATION OF THE COLLEGE.

An arbitrary mark on the iron water table of College Hall, and near the northeast corner, has been taken as a standard bench mark, and is the reference point of all the levels run on the College premises.

Prof. Kedzie, desiring to test the accuracy of elevation of the College as found from the barometer, learned by correspondence with the railroads that the elevation of the D., L. & N. R. R., at its crossing with Michigan avenue was 260 feet above the level of Detroit River, and the M. C. R. R. at the same crossing (both roads use one track at this point), was 810 feet avove the level of the sea. The railroad at this crossing, as found by actual survey, is 9.13 feet below the bench mark previously described.

This bench mark then must be 819.13 feet above the level of the sea, and 269.13 feet above the water in Detroit River.

This bench mark by actual survey is 2.35 feet below the top of the lower front step of the Capitol.

In concluding this report, I wish to call attention to the fact that the success and economy which characterized the various constructions undertaken by this department, were largely due to the efforts of the Engineer of the Boarding Hall, Mr. Geo. Burdick. For no extra compensation, and no relief from his already arduous duties, except such as could be afforded by student labor, he took the immediate oversight of the construction of the dam, laying of the water-pipe between the two halls, zincing the boiler room of Williams hall. He also did much mechanical work about the halls that otherwise would have required the services of a costly mechanic.

R. C. CARPENTER.

STATE AGRICULTURAL COLLEGE, MICH.,
August 31, 1878.

REPORT OF THE PROFESSOR OF AGRICULTURE.

To the President of the Michigan State Agricultural College:

In presenting this report, I wish to call attention to the fact that it covers a period of only eleven months, and consequently will be less complete in some of its particulars, than it would otherwise be. It was thought advisable to make this the time for change in regard to inventory, inasmuch as hereafter the year is expected to close August 30, so that the fiscal and College year begin and end at the same time. This has seemed to necessitate the changes that have been made and which will be duly noticed in their respective places.

The year opened with the Superintendent of Farm and Horticultural departments and myself only to do the work, and the Superintendent largely occupied with the Horticultural department, which was without a regular foreman. On October 5, Mr. G. W. White, farm foreman, was again able to take up his work, and has since that time been unremittingly at his post. On November 20 (a change having taken place whereby the office of Superintendent was abolished, and more responsibility and labor devolved upon me), Mr. Ransom H. McDowell was engaged as assistant foreman, thus making the working force of the department for supervision the same as in former years, although the work of the department has largely increased.

During the winter vacation I attended three Farmers' Institutes, to which I was assigned, and also the one at Saginaw by the advice of yourself on account of the necessary absence of Secretary R. G. Baird.

I attended an independent Institute at Manchester, shortly after,—a very pleasant gathering of farmers and others.

With the opening of the spring term in 1878 we had a working force of 100 students to manage and furnish work for; and as it was decided not to clear any more land this year, some difficulty was experienced in furnishing and planning work for so large a force during the month of March.

The Freshman class was under my instruction in agriculture during the spring term. The number was 107 on the class roll, and having no recitation room capable of holding them, seating room was found first in the armory and afterward in the chapel after it had been reseated and repaired. The interest was well kept up and 96 were present at the final examination of the class.

Some understanding of the course may be gathered from the following questions, which were used on examination:

I. (1) Describe Roman agriculture.
(2) What was the feudal system?
(3) Its effects and when abolished in France?

II. (1) What gave rise to the beet sugar industry in France??
(2) What countries make most beet sugar?
(3) Describe the agriculture of Belgium.

III. (1) Describe a Devon.
(2) A Holstein.
(3) Tell where each is originally found, and for what each is valued.

IV. (1) Name two men who did much to improve Short-horns in England.
(2) When was the first Shorthorn herd book published and who was the editor?
(3) Trace the Duchess family from the cow Duchess to the New York Mills sale of 1873, through the hands of the various breeders.

V. (1) Name one improver of Herefords.
(2) For what are the Galloways noted?
(3) Where were both breeds found originally?
VI. (1) Where are Clydesdale horses found?
(2) For what valued?
(3) What influence has Arab blood had on the horses of Great Britain?
VII. (1) Classify sheep and mention one pure breed in each class.
(2) Classify Merinos and give characteristics of each class.
(3) Classify wools and give the basis of such classification.
VIII. (1) When was the Royal Agricultural Society formed?
(2) What is its work?
(3) What is the value of its work to Great Britain and to the world?

The foregoing will serve as a sample on those topics. On drainage questions like the following were used:

I. (1) Describe three kinds of drains?
(2) How lay out a tile drain?
(3) Name three conditions on which the size of tile used will depend?
II. (1) Where does the water enter tile drains?
(2) How form a junction?
(3) How does the capacity of tile vary when the fall is the same?
III. (1) What is a silt basin?
(2) How constructed?
(3) Name four conditions or circumstances on which cost depends?
IV. (1) How does a sewer differ from a tile drain?
(2) Should sewers and tile drains be run together? if so, which should be the main and why?
(3) What is a trap? how constructed and why used?

During the summer term a course of lectures was delivered to the senior class on the history and characteristics of breeds of cattle, horses, sheep and swine, followed by principles of stock-breeking, after which the subject of farm economy was taken up; and methods of experimenting; but time did not permit us to pursue the last two subjects so fully as was intended. The class numbered 31.

During the year I have delivered one public lecture on "Ups and Downs in Short-horn Prices." I have also kept the books of the farm department, and made out the last report of the Superintendent of the Farm.

Through the efforts of the President of the State Board—Judge Wells—we have obtained and have on deposit 60 stand of arms and equipments. These are for the use of those students who desire military drill and instruction. I have met with and have had the general oversight of the organized company of cadets, which has had a weekly drill.

The armory has been fitted up with gun racks for the reception of the arms, by the college mechanic under my supervision, and shutters have also been placed before all the windows.

The company numbers about 55, with an average attendance of 30 at drills.

There has long been a felt want of a good, reliable mechanic at the College—one whose interests should be identified with those of the College—and for such an one almost constant employment could be found. The State Board, having authorized such an engagement, the committee, of which I was a member, secured the services of Mr. A. M. Clayman, who has taken the brick shop in charge, with all the tools and appurtenances. He has since that

time (July 1, 1878) managed the shop with a view of doing the work of the College as cheaply as may be, while at the same time he employs as many students as possible, instructing them in the proper care and use of tools, and other matters pertaining to mechanism. The aim has been to charge for the repairs and work that goes from the shop only enough to balance the shop account, so that the shop may not be the loser.

The plan so far has worked better than was anticipated, and I would recommend that the present arrangement continue.

EXPERIMENTS.

Considerable time has been spent on the experiments this year, and as the results and observations are somewhat incomplete, I will make a report upon them in in a supplement to be published hereafter, but in the same volume.

FARM DEPARTMENT REPORT.

The Farm Department would respectfully submit the following report, covering a period of eleven months, viz.: from Oct. 1, 1877, to Aug. 31, 1878:

I would first call your attention to the reduction of Inventory noticed in the report of the Secretary. This will explain the poor showing that the farm makes during the period covered by this report. For notwithstanding the reduction in amount of money value we have more stock upon the farm and more bushels of grain, &c., than when the Inventory was taken last year. The tools and lumber in the shop have been transferred by Inventory to the Mechanical Department, to the amount of $93.28.

The crops in the fields have been placed upon the Inventory at about their cost at the time of invoice. Heretofore, on September 30, the yield was estimated, which was not a very satisfactory way of getting at the amounts, and the record of the crop the ensuing year gave the true result.

A large amount of work has been expended on permanent improvements, such as drains, ditches, logging, stumping, and picking stone. Considerable new fence has been constructed during the year. These improvements are beginning to show, especially on fields No. 12, 13, 14, and 15.

During the autumn term of 1877 the entire Freshman class was assigned to the farm for labor. This was done in order to give a smaller force to the Horticultural Department, soon to be in charge of Mr. W. C. Latta, a senior, working under the direction of Superintendent A. B. Gulley. This gave a working force of 93 students for the farm; the working forces of the two departments being quite largely out of proportion.

STUDENT LABOR.

Tho student labor upon the farm has been 31283 hours, for which has been paid $3100.68. Of this labor 8598¾ hours was outside the department.

The account is:

8,598¾	hours outside department, @ 10c	$859 88
22,690¼	" in " @ 09.8756 + c	2,240 80
31,289	Total	$3,100 68.

This amount of labor, because carried out in hours, at first thought, seems large; but, at 10 hours per day, gives 2,269 days' work in the department, or 87 months and 5 days. This would be equivalent to employing 7 men for 1 year with 3 months and 5 days extra time. When we take into account the large amount of work performed on permanent improvements, beside the regular labor of caring for the crops, the amount of labor does not seem so large.

The student labor, as above, has been distributed as follows:

Field No. 1	$28 10
No. 2	40 27
No. 3	48 94
No. 4	74 36
No. 5	109 08
No. 6	187 55
No. 7	50 46
No. 8	339 32
No. 9	76 24
No. 10	86 16
No. 11	122 76
No. 12	32 09
No. 13	51 31
No. 14	61 62
No. 15	70 86
No. 16	118 10
Cattle Barn account	95 50
Horse " "	59 26
Sheep " "	33 94
Piggery account	72 48
Shop "	108 41
Stock "	219 04
Granary "	19 36
Office "	14 64
Grade wheat	6 86
Farm Department account	114 09
Total	$2,240 80

MEN AND TEAM LABOR.

The cost of men and team labor for the year is as follows:

Labor bills of men	$1,145 15
Board of men	483 63
Cost of mens' labor	$1,628 78
Cost of team labor (see horse barn account)	915 71
Total cost men and team labor	$2,544 49

The labor has been charged to the various accounts at the uniform rate of $2.50 per day for man and team, or 25 cents per hour; or 12½ cents per hour

for each alone. This account shows a slight gain, which is represented as follows:

Cash for labor outside department	$640 86
Amount charged to department accounts	1,924 77
Total credit to men and team labor	$2,565 63
Less cost	2,544 49
Balance	$21 14

The small sum shows that the labor was charged very nearly at cost, the actual cost being $2.47.9+ per day.

The men and team labor has been distributed as follows:

Field No. 1	$17 40
No. 2	11 62
No. 3	33 88
No. 4	29 19
No. 5	88 03
No. 6	236 58
No. 7	66 63
No. 8	190 60
No. 9	61 38
No. 10	57 37
No. 11	88 09
No. 12	6 25
No. 13	13 00
No. 14	71 50
No. 15	21 50
No. 16	63
Cattle-barn account	257 07
Horse-barn "	37 50
Sheep-barn "	16 18
Piggery account	48 32
Shop "	9 19
Stock "	463 25
Granary "	1 00
Grade wheat	4 44
Farm department, Sec. 1	94 17
Total	$1,924 77

As considerable work has been done as permanent improvement, I present an account showing the amount and where such work has been performed. The drains and swamp work, including open ditches, will be given separately from other permanent improvements in fields in the following table.

The account for permanent improvements is as follows:

Field No. 1	$1 48
No. 4	139 58

Field No. 5	$6 42
No. 6	1 59
No. 7	72 66
No. 8	5 61
No. 9	4 14
No. 11	32 40
No. 12	43 34
No. 13	32 99
No. 14	85 61
No. 15	109 36
Tile drains No. 2, 129 rods	164 96
Tile drains, Orchard, 143 rods	231 33
Clearing swamp, Nos. 11 and 13	128 50
Tile drains Nos. 9 and 11	236 05
Farm Department Account—filling muck bed, labor in lanes, on road, etc.	122 81
Labor on experiments during the year	37 31
Total	$1,456 14

This labor and material put into permanent improvements, is not shown to the credit of the farm, as when once done it is considered as part of the farm, and does not appear on inventory.

The farm is inventoried as separate from the department, and has for some time been retained at the same standard of value.

The fields will appear in regular order.

FIELD NO. 1.

The east end has been turned over to the Horticultural Department by consent of the State Board and the mutual agreement of the Superintendents of the two departments. The west end, 4.22 acres, has been plowed and planted to corn. The plowing was done in December, on account of expected pressure of other work in spring.

The account of the field is as follows:

	Dr.	Cr.
To preparing ground and planting	$14 24	
cultivation of crop	29 78	
seed corn	65	
permanent improvement	1 48	
By " "		$1 48
inventory of crop at cost up to August 31st, estimating student's labor at 10 cents an hour		46 50
To balance	1 83	
	$47 98	$47 98

FIELD No. 2

was sown to wheat in 1877. The varieties sown were Arnold's Gold Medal and the Asiatic, mentioned in a former report. These came up well and looked finely for a few weeks; but it soon became evident that the wheat was being devoured by the Hessian fly. They worked badly in both varieties (soil sandy loam), but worse in the Asiatic than in the other.

The warm rains and open weather in December, 1877, encouraged us somewhat in regard to results: but in spring all hopes of the crop were dispelled by the appearance in unlimited numbers of the second brood, or more properly the spring brood. These attacked what remained from their fall work, and nearly ruined it.

Four or five tile drains were put down across the east side of the field, making 129 rods of drain.

The field was seeded to grass (timothy and clover) in the spring, and will remain as meadow except the small part at the east side, which is used by the Horticultural Department for berries and other small fruits. The low or marsh ground was mown, the hay being of poor quality and hardly paying for the labor in cutting.

The account of the field is as follows:

	Dr.	Cr.
To wheat (Inventory 1877) sown	$125 00	
labor on hay	8 82	
labor on experimental grain	20 29	
114 lbs. clover seed @ $4.50	8 55	
42 lbs. timothy seed @ $1.70	1 58	
plaster	2 88	
labor on seeding and plaster	7 12	
labor harvesting and threshing	16 51	
threshing bill, 119 bushels @ 4c	4 76	
By hay from marsh, 5400 @ $4.00, 1000 @ $5.00	-------	$13 30
119 bushels wheat	-------	119 00
8 tons straw @ $2.50	-------	20 00
labor expended on experiments	-------	20 29
balance	-------	22 92
	$195 51	$195 51

The cost of the wheat was $146.27, or over $1.00 per bushel, on account of poor yield. The area sown was about 12½ acres; but the reaper was run over only 8½ acres in harvesting. The cost of seeding was $20.13, including the plaster, which was sown for the benefit of the grass. The field will be mown next year.

FIELD No. 3

was meadow. The excess of timothy sown, together with the dry weather during harvest, 1877 (mentioned in last report), choked or dried up the clover, so that the grass this year was very largely timothy.

The field was mown, commencing on July 1st. The hay secured was of fine quality and in excellent condition. The account of the field is as follows:

	Dr.	Cr.
To labor in hay and in sowing plaster	$74 97	
moving old stack bottom	7 85	
1,776 pounds plaster, @ $4.50	4 00	
By 96,965 pounds hay, @ $8.00	-------	$387 86
To balance	301 04	
	$387 86	$387 86

The yield was nearly 4,100 pounds per acre, and cost, delivered in the barns, \$3.70 per acre or \$1.80 per ton, nearly.

FIELD NO. 4

was to be divided into small lots for the better accommodation of a few animals near the barns. It was divided so as to give six small lots, varying from 1 to 4 acres in size. A lane, two rods in width, divides the field and extends to the river. One of the small fields was sown to corn for soiling feed. The cost of the crop has been charged to the cattle barn where the forage has been consumed. The account of the field is as follows:

	Dr.	Cr.
To cost of soiling corn, seed, and labor	\$23 71	
500 pounds plaster and sowing	2 13	
labor, stumping	12 26	
labor on fence	50 85	
oats	25	
lumber, @ \$12	47 41	
75 pounds nails, @ 3 cents	2 25	
214 posts, @ 12½	26 75	
By oats	-------	\$1 05
permanent improvement	-------	12 26
fence, at cost	-------	127 32
soiling, at cost to cattle barn	-------	23 71
by loss to balance	-------	1 27
	\$165 61	\$165 61

The new fence was 102 rods in length, but in the cost of fence are included several extra items. One of them is the moving of 20 rods of portable fence; another is the taking down of nearly 30 rods of old board fence, straightening up the posts, and with now and then a new board, rebuilding it. The cost of the new fence did not exceed 95 cents per rod.

The item of oats in the account is for a bushel of New Zealand oats that were sown late in one part of the plat devoted to soiling corn. There was a yield of three bushels credited at \$1.05. The oat plat was dug through the center and oats destroyed by the repair of sewer running from boarding hall for a width of at least 10 feet. The variety will be tried next year, with better opportunities and surroundings.

The division of No. 4 into small fields as planned has been one of the greatest conveniences of the farm. The lane is extended to the main lane near the barns and new gate put in for convenience in reaching the small fields without passing through the yards.

FIELD NO. 5

was in pasture the remainder of 1877 and plowed for corn in 1878. In this field was the experimental corn for this year. In the southeast portion of the field, clearing was in progress at the close of the last year. This was carried on to completion and whatever wood there was, sold to the boarding hall at \$2.25 per cord to assist in paying for the clearing. The trees were few and scattering. Began plowing for corn April 23d. The land was harrowed thoroughly twice,

rolled, and the corn drilled in 4 feet two inches apart with grain drill, sowing two rows at once. The planting was begun on May 15 and finished on the 17th. The corn was cultivated, commencing May 28, twice in a row, and then thinned to 14 inches in the drills and hoed at the same time. It was cultivated again in June and a third time in July, beginning on the 11th, some parts being hoed the second time more perhaps to keep down the grass than to benefit the corn. The crop has been inventoried at nearly its cost August 31, 1878.

The account with the field is as follows:

	Dr.	Cr.
To wood, $4\frac{1}{2}$ cords (Inv.), @ \$2.00	\$9 00	
labor clearing	19 48	
By $8\frac{1}{4}$ cords wood, @ \$2.25		\$18 56
$1\frac{3}{4}$ " " (Inv. '78), @ \$2.00		3 50
balance		6 42
	\$28 48	\$28 48

The account with the corn crop is as follows:

	Dr.	Cr.
To preparing for and planting	\$58 31	
labor on experimental corn	17 02	
manure	21 00	
labor on manure	13 97	
seed corn	5 52	
cultivation of crop	107 16	
By inventory of crop		\$244 18
To balance	21 20	
	\$244 18	\$244 18

The crop is growing finely and promises well at this date.

FIELD NO. 6.

The year opened with a crop of roots growing upon the south part of the field. An oat crop had been harvested from the north part, a portion of which was estimated in the account of 1877, as only a part of the crop had been threshed. The account with these crops is as follows:

	Dr.	Cr.
To roots as per Inv. 1877	\$580 00	
labor harvesting	207 35	
By 11,600 bu. roots, @ 7c.		\$812 00
To balance	24 65	
	\$812 00	\$812 00

The account shows that taking the crop at the inventory the roots cost less than 7 cents per bushel in the pits, after paying for all the manure, labor on manure, and permanent improvement upon the field.

The account with the oats is this:

Oat Crop of '77.

	Dr.	Cr.
To oats as per inventory '77	$138 50	
threshing	6 10	
By 434 bush. oats, @ 30c.	....	$130 20
10 tons straw, @ $3.00	....	30 00
To balance	15 60	
	$160 20	$160 20

The crop in 1878 upon this field has been oats and barley, and the land has been prepared for the wheat crop that follows it. The account is as follows:

	Dr.	Cr.
To preparing ground for barley	$9 77	
seed barley	9 11	
harvesting barley	13 99	
harvesting and threshing	6 50	
threshing 197 bush., @ 4c.	7 88	
By 197 bush. barley, @ 50c.	....	$98 50
5 tons straw, @ $2.00	....	10 00
To balance	61 25	
	$108 50	$108 50

The south part of the field, 5 acres, was in barley. The yield, nearly 40 bushels per acre. The cost in the granary was nearly 24 cents per bushel. The barley was drilled in at the rate of 2½ bushels per acre.

Oat Crop, 1878.

	Dr.	Cr.
To preparing ground for and sowing	$44 96	
seed	29 92	
harvesting	49 34	
By oats, 800 bu., at 20c, estimated, as per inventory, '78	....	$176 00
straw, as per inventory, '78	....	110 00
To balance	161 78	
	$286 00	$286 00

The oats sown were of White Schoonen variety, and were drilled in east and west at the rate of 2½ bushels per acre. The crop is unthrashed, as yet, and was raised on the north side of the field, 23 acres.

There was $1.59 of permanent improvement put upon the field during the year.

After the oat crop was taken off the barley and oat stubble was immediately plowed for wheat. The land has been harrowed once, in which condition it now remains. It may be of interest to remark here that many larvæ of the Hessian fly were found in the barley and some, even, in the oats; thus showing that they are not wholly partial to wheat, but may attack other kinds of grain. The cost of the wheat ground as prepared is—

To manure	$78 50
labor on manure	42 63
labor, preparing ground	48 75
Carried to '79 account	$169 88

FIELD NO. 7.

This field has been used for pasture for most of the year. Much of the brush has been burned, some timothy seed has been sown, and some wood has been cut. The account of the field is as follows:

	Dr.	Cr.
To wood, as per inventory, '77	$211 00	
rails	2 70	
labor, on wood cut, etc.	117 09	
to timothy seed	1 00	
By $42\frac{1}{4}$ cords 4-ft. wood, @ $2.25 $46\frac{1}{4}$ " 18-in. " @ $1.20	-------	$164 43
14 cords wood (Inv.), @ $1.50	-------	21 00
5 " " " @ $1.00	-------	5 00
100 fence stakes (Inv.), @ 3c	-------	3 00
$31\frac{1}{2}$ cords wood (Inv.), @ $2.00	-------	63 00
rails to farm department	-------	2 70
balance (permanent improvement)	-------	72 66
	$331 79	$331 79

A large part of the labor in this field has been in clearing and burning, so as to fit the field as rapidly as possible for cultivation.

FIELD NO. 8

was in corn when the last report was closed, the corn standing in the shock, unhusked. The corn was harvested, and the stalks secured in good order. The account with this crop was as follows:

	Dr.	Cr.
To corn as per inventory '77	$280 00	
stalks as per Inventory '77	40 00	
harvesting crop	115 38	
labor on experimental corn	3 36	
By corn	-------	$448 05
20 tons stalks @ $2.00	-------	40 00
To balance	49 31	
	$488 05	$488 05

The estimate of corn was too low, as the field yielded 1626 bushels of ears, or at the rate of $81\frac{3}{4}$ bushels per acre. The corn cost in the crib, 24 cents per bushel, nearly.

The potato crop of 1877, three acres, was rather poor; the account is as follows:

	Dr.	Cr.
To potatoes, as per Inventory '77	$66 00	
labor in harvesting	25 22	
By potatoes sold	....	$77 84
balance	....	13 38
	$91 22	$91 22

The yield was 227½ bushels, of which the large ones were sold at 30 to 40 cents per bushel, and the smaller ones at 15 cents. The yield was estimated in the Inventory at 220 bushels. The Compton's Surprise did so poorly that they will be abandoned next year.

FIELD NO. 9

was being cut for clover seed at the close of the last report; the crop was estimated to be worth $75.00. The crop was secured in good order; has been threshed and yielded 32½ bushels or 1.27 bushels per acre. The field was to be in pasture, but the large amount of pasturage on some other fields led me to change the plan slightly and cut an early crop of rowen hay. The grass was cut commencing June 17, when the timothy was with the head in the sheath and the clover only showing an occasional blossom. The crop was secured in fine order, a little rain falling on four or five tons, but not enough to damage it. The yield was 4,100 lbs. per acre or over two tons. The account of the field is as follows:

	Dr.	Cr.
To clover seed as per inventory	$75 00	
labor in clover seed	47 85	
labor in hay	82 40	
labor on fence	1 18	
sowing plaster	3 23	
1,200 lbs. plaster @ $4.50	2 70	
labor on drains	2 96	
threshing clover seed, 32½ bush. @ $1.00	32 50	
By 32½ bush. clover seed @ $4.50	....	$146 25
97,311 lbs. of hay @ $8.00	....	387 24
permanent improvement	....	4 14
To balance	289 81	
	$537 63	$537 63

The hay cost about $1.82 per ton delivered in the barn, for labor and plaster sown. The clover seed cost $2.95 per bushel delivered in the granary. This field is now in pasture.

FIELD NO. 10.

This field was already sown to Clawson wheat, the wheat being inventoried at $220.00 on the ground, or at $10.00 per acre. The Hessian fly did very little damage in this field, and the wheat was a very good crop both as regards quantity and quality. That sown on the drained muck bed did not succeed very well, but the ground was seeded and had become so dry that the reaper

was run over the entire swamp, where horses were mired last year. The field has been measured and gives an area of 20.15 acres on which wheat grew, and the yield was 35.99 bushels per acre. The account with the field is as follows:

	Dr.	Cr.
To oat crop '77, as per Inventory	$314 00	
threshing the same	34 82	
threshing bill	20 32	
By 1016 bushels oats @ 30c	-------	$304 80
20 tons straw @ $3.00	-------	60 00
To wheat as per Inventory	220 00	
labor seeding	7 16	
185 lbs. clover seed @ $4.50	13 88	
173 lbs. timothy seed @ $1.56 + 42 cents freight	6 42	
threshing 724 bushels wheat @ 4c	28 96	
labor, harvesting and threshing	101 55	
wood for engine (two cords)	3 00	
By 724 bushels wheat @ $1.00	-------	724 00
48 tons of straw @ $1.50	-------	72 00
To balance	410 69	
	$1160 80	$1160 80

The balance on oat crop shows a loss of $4.34 from estimate of the previous year. The wheat crop shows a gain of $414.63. The wheat cost, in the granary, a little less than 43 cents per bushel, including the cost of seeding the field to timothy and clover. Without that the cost was 39 cents per bushel.

The catch of grass was very fine, and promises well for next year. In this field were sown the experimental grasses. The results will be noted in the supplement.

FIELD NO. 11

was in corn at the time of making last year's report. This crop was secured, and in the spring the ground was plowed for oats; the crop sown and the land seeded to clover and timothy. The swamp has been cleared, and a large amount of work done there by way of permanent improvement.

The account is as follows:

CORN CROP 1877.

	Dr.	Cr.
To 1,100 bushels corn (estimated) and inventoried @ 20 c	$220 00	
20 tons stalks @ $2.00	40 00	
labor in harvesting, etc.	90 98	
By 1,075 bushels corn	-------	$280 35
20 tons stalks @ $2.00	-------	40 00
balance	-------	30 63
	$350 98	$350 98

The corn was charged to the cattle barn at the uniform price of 30 cents per bushel of ears, and the poor corn to the piggery at the price of 15 cents per bushel of ears. The corn cost in the crib 23+ cents per bushel.

OAT CROP 1878.

	Dr.	Cr.
To labor on permanent improvement	$32 40	
labor preparing ground for crop and sowing	42 07	
seed oats	21 26	
labor seeding to grass	4 21	
grass seed, 5½ bu., 3-5 timothy and 2-5 clover, @ $4.35	23 94	
plaster, 1,000 lbs, @ $4.50	2 50	
harvesting oats	32 47	
By permanent improvement	....	$32 40
700 bushels oats (estimated) @ 20c	....	140 00
40 tons straw @ $2.50	....	100 00
To balance	113 55	
	$272 40	$272 40

FIELD NO. 12

was in pasture during the entire year. The labor in this field was expended in logging, picking and burning. The fence on the west side of the field has been relaid on new blocks, staked and wired. The account with the field is as follows:

	Dr.	Cr.
To labor	$38 34	
12½ lbs fence wire @ 8c	1 00	
100 fence stakes @ 3c	3 00	
50 fence blocks @ 2c	1 00	
By permanent improvement	....	$43 34
	$43 34	$43 34

FIELD NO. 13

was also in pasture during the year. The large swamp of 10 acres was cleared during the winter and a ditch dug on the south and east sides. This will drain the swamp sufficiently until tile drainage can profitably be employed to do the remainder. The hard land has had quite an amount of labor expended in logging and burning, but there remains much more yet to be done.

The account with the field is as follows:

	Dr.	Cr.
To 14 cords wood inventoried in 1877, @ $2.00	$28 00	
labor	51 56	
By 21¾ cords wood, @ $2.25	....	$48 94
2 cords wood, inventoried 1878, @ $2.00	....	4 00
121 rails, inventoried 1878, @ $3.00	....	3 63
To 25 lbs. fence wire, @ 8c	2 00	
200 fence stakes, @ 3c	6 00	
100 " blocks, @ 2c	2 00	
By permanent improvement to balance	....	32 99
	$89 56	$89 56

The above does not include the cost of ditching or clearing, which was let by the job; the reason for this being that many of the students had already been severely poisoned by working there. The fence on the east line of the field was relaid, staked, and wired. The distance was about 45 rods. A gate was also put in at the northwest corner of the field, opening into the lane.

FIELD NO. 14

was broken up and planted to corn this year for the first time. There was considerable labor expended in fitting the ground for the crop on account of the rough condition of the field. The west part was not touched: the east part had been partly logged. The corn is growing well and looks medium considering the unpromising condition of things to begin with.

The account with the field for the year is as follows:

	Dr.	Cr.
To clearing, logging, etc.	$35 66	
picking up	1 80	
labor on fence	22 40	
460 fence stakes @ 3c	13 80	
230 fence blocks @ 2 c	4 60	
57½ lbs. fence wire @ 8 c	4 60	
keg 12d for R. R. fence	2 75	
preparing for and planting crop	39 84	
cultivation	33 42	
seed corn	1 68	
By 8 acres of corn inventoried Aug. 31, 1878, nearly at cost of labor expended on field	....	$135 58
balance	....	24 97
	$160 55	$160 55

The fence on the south and west sides of the field was relaid, put upon the line, staked and wired. The distance was about 115 rods.

The keg of nails was used in putting one nail in each post at each board, as the fence was not considered very strong along the railroad, and our stock were liable to get upon the track.

The fence is now considered secure. A part of this amount ($2,75) might strictly be charged to fields No. 12, 13 and 15, as the railroad borders on each of these fields, and a part of the nails were used there.

FIELD NO. 15

was in permanent pasture during the entire year. There was considerable labor expended in relaying fence on the east and south sides of the field. The fence was staked, wired, and laid on new blocks. The length of fence built was about 137 rods. Some clearing had to be done in order to get the fence on the line on the south side of the field.

The remainder of the labor has been expended in logging and burning. The account of the field is as follows:

	Dr.	Cr.
To labor	$92 36	
55 lbs. fence wire @ 8c.	4 40	
220 fence blocks, @ 2c.	4 40	
440 fence stakes, @ 3c.	13 20	
By $2\frac{1}{2}$ cords wood, inventoried @ $2.00	....	$5 00
balance (permanent improvement)	....	109 36
	$114 36	$114 36

FIELD NO. 16

includes a small amount of labor in No. 17 in cutting wood, and also some labor in picking and burning in the lane leading to the D., L. and N. R. R. The account is as follows:

	Dr.	Cr.
To labor	$118 73	
By 175 fence stakes, inv. @ 3c.	....	$5 25
80 " " @ 2c.	....	1 60
44 fence rails, @ 3c.	....	1 32
$24\frac{3}{4}$ cords wood, inventoried @ $2.00	....	49 50
1,200 fence stakes, charged to accounts of fields Nos. 12, 13, 14 and 15, @ 3c.	....	36 00
600 fence blocks, charged as above, @ 2c.	....	12 00
214 fence posts, charged to field No. 4 account, @ $12\frac{1}{2}$c.	....	26 75
To balance	13 69	
	$132 42	$132 42

FIELD NO. 17

remains the same as last year.

The river field east of field No. 7, remains untouched, as also does the land south of the D., L. and N. R. R.

The remaining accounts will be taken up in their regular order.

CATTLE BARN ACCOUNT.

The corn crop has been charged directly from the field to the cattle barn; also the corn-stalks and straw. Afterward, what has been taken from the barn has been credited to the account. The balance, $1,789.01, has been carried forward and charged to the stock account.

HORSE BARN ACCOUNT.

This account shows the expense of keeping the teams of the farm in working order, including all repairs to harness, wagons, &c.

	Dr.	Cr.
To Inventory of teams and team equipments, Oct. 1, 1877	$1849 70	
hay on hand	319 30	
grain charged during the year	268 99	
labor cutting feed, care of barns, colts, &c.	96 76	
hay charged from crop of 1878	393 13	
cash disbursements on account of teams	130 58	
80 lbs. plaster for disinfecting purposes @ $\frac{1}{4}$c.	20	

	Dr.	Cr.
By Inventory of teams and team equipments, Aug. 31, 1878	....	$1652 50
hay on hand, as per inventory same date	....	393 13
hay sold from barn during year	....	29 46
ground feed sold	....	7 23
cash receipts (horse, etc.)	....	60 63
amount carried to account of men and team labor	....	915 71
	$3,058 66	$3,058 66

SHEEP BARN ACCOUNT.

This is the account for feed, including grain. The manure has been credited at 50 cents per load, and charged to the field where it was drawn. The account shows a loss from two causes; the first, that the large amount of hay on hand was very damp and of overweight when drawn in 1877, and much of it molded and was very poor feed, thus requiring more of other feed; the second cause was the general reduction of inventory from last year.

The account is as follows:

	Dr.	Cr.
To sheep, as per inventory Oct. 1, 1877	$910 00	
hay, as per inventory Oct. 1, 1877	438 30	
manure, as per inventory Oct. 1, 1877	5 00	
rye straw for binding corn	20 00	
labor	50 12	
grain fed	52 72	
hay, crop of 1878	239 88	
cash disbursements on account of	76 92	
By sheep, as per inventory Aug. 31, 1878	....	$816 00
hay on hand, as per inventory Aug. 31, 1878	....	285 88
corn sold	....	60
rye straw	....	20 00
manure sold	....	35 00
cash receipts from wool, etc.	....	362 15
balance	....	273 31
	$1,792 94	$1,792 94

The flocks did not shear quite as heavily on an average as they did last year. The Merino ram Armada sheared 19 lbs. 5½ oz. The imported Southdown ram Baronet sheared 8 lbs. 2 oz. The Cotswold 2 years old sheared 8 lbs. 15 oz. The Highland ram Rocky sheared 5 lbs. 13½ oz.

The averages were as follows:

13 pure Merinos average	8 lbs.	13 19-26 oz.
37 grade " "	8 lbs.	14 27-37 oz.
50 Merinos average	8 lbs.	2 3-5 oz.
25 pure Southdowns average	4 lbs.	7 oz.
12 grade Southdowns average	4 lbs.	6 5-6 oz.
37 Southdowns average nearly	4 lbs.	7 oz.
2 pure Cotswolds average	9 lbs.	3 oz.
23 grade " "	7 lbs.	8 oz.
52 Cotswolds averaged	7 lbs.	10 4-25 oz.

The average of 113 fleeces was 6 lbs. 13 oz. The wethers had nearly all been sold from the flock the fall previous, which accounts in part for the falling off. The breeding ewes have reared 47 lambs the present season. The flock at present numbers 134.

THE PIGGERY ACCOUNT.

The hog and pork interest during the last year has been in a very depressed condition, and the consequence has been that fewer sales of hogs have taken place for breeding purposes, and when pork has been sold it has been at a loss. Added to this the inventory has been cut down nearly one-half.

The swine record shows 78 animals on the inventory against 34 last year. The account is as follows:

	Dr.	Cr.
To swine as per inventory Oct. 1, 1877	$682 00	
labor in care	121 79	
feed consumed—corn, roots, small potatoes, screenings, etc.	134 07	
cash disbursements on account of,—mostly mill feed	103 90	
straw for bedding	1 00	
5 cords 18 inch wood @ $1.50	7 50	
By corn sold	-------	$00 45
manure charged to fields	-------	11 00
cash receipts	-------	234 21
swine as per inventory Aug. 31, 1878	-------	697 00
balance	-------	107 60
	$1,050 26	$1,050 26

SHOP ACCOUNT.

This account is for the care of tools and their ordinary repairs, grinding, etc. On July 1, 1878, the brick carpenter shop was turned over to Mr. A. M. Clayman, the College mechanic, who was employed by a committee. The tools and other appurtenances to the amount of $93.28 were assumed by the shop as a part of its inventory. The labor in the shop is generally spent on repairs. Six farm gates were made during the year, and three of them placed on the farm.

The account is as follows:

	Dr	Cr.
To labor	$117 57	
hardware	24 16	
paints	4 66	
By 6 gates @ $3.00	-------	$18 00
lumber sold	-------	6 41
hardware	-------	2 85
balance	-------	119 13
	$146 39	$146 39

Three and one-half hours of time each day are given to giving out, recording, and checking off the hand implements used by the students, or in their repairs

or miscellaneous jobs. This for the working days gives about 660 hours including the time spent in distribution of bills at the end of each month, or $66.00. Hereafter the time of the boy caring for tools will be charged to farm department general account.

STOCK ACCOUNT.

This account is more properly the account of the cattle upon the farm. The cattle comprised at the time of inventory, Aug. 31, 1878, the following breeds, viz.:

Shorthorns, 26; at the head of which herd stands Rufus 18275; also the young bull Gen. Custer 29618, lately from the herd of Avery & Murphy of Port Huron.

Devons, 8; at the head of which herd stands Batavia 159.

Ayrshires, 13; at the head of which herd stands Horace 1630.

Jerseys, 2; the bull Saginaw 2044 and cow Irene 2d.

Galloways, 7; at the head of which herd stands Johnny Scott.

Herefords, 1; Cora 3d.

Grades and cross-bred animals, 4; making a total of 61 animals, representing 6 distinct breeds, besides the grades and cross-bred animals. I hope to be able to add a pair of pure-bred Holsteins to our herd at no distant day, as they represent one of the dairy breeds and bid fair to become quite an acquisition to our State. The herd is in fine condition, every cow but one having bred during the year. Milk has been sold to the boarding hall at 1½ cts. a pound. The sales of breeding stock from the various breeds have not quite equaled those of the year previous.

The summary of the account is as follows:

	Dr.	Cr.
To cattle as per inventory Oct. 1, 1877	$8,085 00	
labor in care, milking, etc.	682 29	
amount from C. barn account	1,789 01	
By cattle as per inventory Aug. 31, 1878		$6,210 00
cash receipts—milk, butter, breeding stock, beef, etc.		1,515 17
other cash receipts		19 96
balance		2,811 17
	$10,556 30	$10,556 30

Through the lessening of the inventory, largely, our stock account shows quite a large loss, but we have practically but 11 months represented in receipts and have the full cost of the keep for the year except the labor. The cattle while in pasture are not charged with pasturage.

GRANARY ACCOUNT.

The account shows labor on grain after placed in the granary and labor in marketing. The amount expended this year has been $19.52.

OFFICE ACCOUNT.

This account shows the expense of the office, in blank books, stationery, stamps, cards, &c., including fuel.

The account for the year is as follows:

	Dr.	Cr.
To amount on hand, as per inventory Oct. 1, 1878	$2 75	
labor, &c.	14 94	
cash disbursements	52 98	
By amount stationery, coal, etc., on hand, as per inventory Aug. 31, 1878		$39 07
balance		31 60
	$70 67	$70 67

GRADE WHEAT.

This account shows the result of the wheat sown on the lawn or field north and west of the President's house. Most of the labor in preparation of ground was charged to improvement of grounds, as the ground had to be plowed and worked to smooth it down even though no crop were raised.

The wheat was inventoried at $8.00 per acre. The area that was harvested was 3.7 acres, and was injured quite severely by Hessian fly. The Treadwell variety was sown on all but a small corner by the pear orchard.

The account with the field is as follows:

	Dr.	Cr.
To wheat, as per inventory 1877	$30 00	
450 lbs. plaster and sowing	1 01	
labor in harvesting and threshing	11 30	
½ cord wood for threshing	75	
threshing bill	2 16	
By 54 bushels wheat @ $1.00		$54 00
To balance	8 78	
	$54 00	$54 00

The ground was seeded to clover and timothy to remain as permanent lawn in grass. The cost was charged to No. 2 account, as this is in the same enclosure.

FARM DEPARTMENT ACCOUNT.

This account is for sundry matters not strictly chargeable to any other account. The summary of the account is as follows:

	Dr.	Cr.
To labor on temporary cribs	$17 60	
cost of exhibit at Central Fair in 1877	9 93	
labor in lane on road, filling holes, &c.	35 16	
repairs of barns	26 26	
filling hole in muck bed in rear of barns	39 46	
miscellaneous items, teaming, etc.	77 08	
By balance		$205 49
	$205 49	$205 49

This closes the record of field and other accounts for the year. The year on the whole, has been quite a prosperous one. There has been considerable work done in permanent improvement which has mostly been noticed under

the record of the different fields. Some surveying has been done in various places that will probably be noticed in Prof. Carpenter's report.

The drains in the orchard have been completed, and also those in No. 2. Some drainage has also been begun in field No. 9.

On carefully looking over the timber directly south of No. 14, I recommend that 25 acres be cleared in No. 16 in the spring of 1879, and that No. 15 be got in crop if possible, in the same year. The plan of arrangement of crops for 1879 is as follows:

No. 2, Meadow.
No. 3, Pasture.
No. 4, Pasture and soiling.
No. 5, Roots.
No. 6, Wheat seeded with grass.
No. 7, Wood pasture.
No. 8, Oats.
No. 9, Corn.
No. 10, Meadow.
No. 11, Pasture.
Nos. 12 and 13, Pasture.
No. 14, Barley, followed by Wheat.
No. 15, Corn, if broken up.
No. 16, to be cleared.
No. 17, Some ditching to be done.

The rotation has brought field No. 9 to the point of starting, and hereafter I propose to give the result from each field as it closes the 6 years' rotation.

The record of No. 9 is as follows:

1873. Corn, gain	$352 88
1874. Roots, charged to stock at cost.	
1875. Oats, gain	223 88
1876. Wheat, gain	122 06
1877. Meadow, gain	475 61
1878. Pasture (one crop mown), gain	289 81
Total gain in six years over expenditures in labor and manure	$1,464 24

This gives an average of $244.04 profit for each year on an area of 23⅗ acres. It will be noticed that the least profit was received in the year in which the field was in wheat.

Before closing this report I wish to call attention to that portion of the report of the Secretary relating to the farm. To give the true result of the years' work on the farm, credit should be given for $1,456.14. This sum, with the cutting down of the inventory $1,976.82, gives a sum of $3,482.96, thus leaving $875.45 apparently unaccounted for. This, however, is more than made up by the difference in the manner of inventorying the crops of corn, potatoes and roots, being in all 54 acres of growing crops. These have been inventoried at cost to Aug. 31, 1878, and have not been estimated at their probable value on harvesting as heretofore.

In closing let me express my approbation of the patient and thorough assistance I have received at the hands of the foreman, Mr. G. W. White, and the assistant foreman, Mr. R. H. McDowell. In fact all connected with the

department have done well. The plan of having senior students take charge of some particular piece of work has been continued and has worked well. It is hoped in closing this report that the next one will be for a full year, as it will thus be more satisfactory to those who consult it as well as to the head of the department. This report only gives results under my own management from November 20, 1877.

Respectfully submitted,

C. L. INGERSOLL,
Professor of Agriculture.

STATE AGRICULTURAL COLLEGE,
Lansing, Mich., August 31, 1878.

DONATIONS

TO THE COLLEGE DURING THE YEAR ENDING AUGUST 31, 1878.

Reported by PRES. ABBOT:
Fifty copies of Judge W. V. Way's "Facts and Historical Events of the Toledo War of 1835." By Gen. J. W. Brown.
Reported by R. C. CARPENTER:
One Sibley's Level. By A. J. Bicknell, of New York.

DONATIONS TO THE FARM DEPARTMENT.

From HON. R. E. TROWBRIDGE:
¼ bushel fowl meadow seed.
From MR. LOWRIE, Fowlerville, Mich.:
One bushel New Zealand oats.
From KARL E. RUDD, of Cassopolis:
One gate and one wagon-jack.
From L. F. INGERSOLL, Oakland county:
Samples of wheat, as follows: Deihl, Lincoln, Clawson, White Rose, and Treadwell.
From B. HULICK, Shiawassee county:
Samples of Gold Medal wheat and clover seed.
From Mr. G. E. BRECK, Van Buren county:
Samples of two varieties of dent corn.
From DR. KEDZIE:
Sample of Powers' wheat.
From A. J. ARMSTRONG, Kalamazoo county:
Sample of Armstrong wheat and several hybrid varieties.
From JARVIS & HOOPER, Detroit, Mich.
200 lbs. homestead superphosphate.
200 lbs. potato grower superphosphate.

DONATIONS TO HORTICULTURAL DEPARTMENT.

From WM. H. CARSON, through Rural New Yorker, 125 Chambers St., N. Y:
Package of Beans, Mont D'or or Golden Butter Pole.
" " Cuba Asparagus Pole.
Corn, Crompton's Early Field.
" Hickox's Improved Sweet.
Cabbage, Newark Early Flat Dutch.
" Excelsior Flat Dutch.
Celery, Crawford's Half Dwarf.

Carrot, Long Red French.
" Early Half Long Carentan.
Chufa or Earth Almond.
Cucumber, Peerless White Spine.
Onion, Giant Rocca Indian.
" Marzajola or March.
" Maggiajola or May.
" Agostegna or August.
Radish, Early White Giant Stuttgart.
Tomato, Blount's Champion Cluster.
" Acme.
" Trophy.
Lettuce, Marshall's Head.
" California Curled.
" American Gathering.
" Head Corn Salad.
East India Mullet, Antirrhinum, Molucella lævis, Petunia, Candituft, Mentzelia ornata, Liatris spicata, Piosinte reana luxurians, Mignonette.

From INDUSTRIAL UNIVERSITY, Champaign, Illinois:
One Ear Husk Corn.

From DR. H. B. PETERSON, Owosso, Michigan:
Scions of Mandrake Apple.

From HON. H. G. WELLS, Kalamazoo:
One pkg. Striped Carolina Watermelon.

From C. ENGLE, Paw Paw, Mich.:
Quantity Seeds of Quince.

From FRANK D. WELLS, Grass Lake, Mich.:
3 pints 1st Prize Lincoln Wheat.

From THOMAS G. HUNT, Leslie, Mich.:
3 Stalks Dent Corn, 13 ft. long.

From O. D. PHELPS, Portland, Oregon:
Pkg. of Wheat, of Oats, of Barley.

From G. H. BUTTON, Unida, Kane Co., Illinois:
Descriptive Catalogue.

From EDWARD D. COLE, Lansing, Mich.:
Pkg. White Belgian Oats.
" Chinese Hulless "
" Rye, White Russian Spring.

From DAN W. VAN AUKEN, North Lansing, Mich.:
2 Ears Tuscarora or Flour Corn.

From DR. JOHN A. WARDER, Ohio—Scions of the following varieties of Apples:
Ohio Nonpareil, Nickajack, Kentucky Longstem, New York Spice, Griffith, Indiana Favorite, Minois Greening, Roman Stem, Domine, Smith's Cider, Harvest Red streaked Menagere, Grimes' Golden, Early Pennock, Carter's (N. C.), Jeffries, Fall Queen, Culp, Fink, Clyde Beauty, Bethlemite, Philip's (sweet), Fulton, Housum, Dr. Watson, Hoadly, Kirkbridge, Ashmore, Bonum, Canada Reinette.

From D. S. MARVIN, Watertown, N. Y.:
1 Grange Potato.

From PROF. A. J. COOK, Agricultural College:
6 plants of Glen Dale Strawberry.
From E. S. PORTER:
2 Pkgs. Onion Seed, one Carrot.
From E. LEWIS STURTEVANT, Boston, Mass.:
Pkg. Seed Corn.
From A. G. GULLEY, South Haven:
Pkg. Peach Pits.
From ARTHUR GREENMAN, Lockport, N. Y.:
50 Patent Tree Bands.
From J. M. THORBURN, Seedsman, 15 John St., New York. Seeds in small packages as follows: Rosa setigera (Prairie Rose), Pentstemon cobœa, Vernonia Lindheimeri (Texas), Liatris pycnostachya, Pentstemon secundiflorus, Pentstemon grandiflorus, Pentstemon confertus var. cœruleo-purpureus (Rocky Mts.), Pentstemon Murrayanus (Texas), Pentstemon glaber (Oregon), Pentstemon cobœa var. purpurea (Arkansas), Clematis graveoleus (China), Clematis crispa (Georgia), Clematis Pitcheri (Arkansas), Clematis verticillaris, Petalostemon violaceum (Texas), Petalostemon multiflorum (Texas), Liatris punctata (Texas), Liatris scariosa (Arkansas), Liatris elegans (Texas), Rosa Californica var. ultra montana, Liatris spicata (spiked blazing star), Sisyrinchium grandiflorum (Oregon), Ipomaea ieptophylla (Colorado), Engelmannia pumatifida (Texas), Aquilegia cœrulea (Rocky Mts.), Gaillardia pulchella (Texas), Panicum virgatum, Eupatorium Eryngium Leavenworthii, Glaucium luteum (horned poppy), Petunia grandiflora (fimbriata fl. pl., coll. Benary), Mixed Zinnia Darwinii, Solanum rostratum, Linum Berlandieri (Texas), Cassia Rœmeriana (Texas), new crimson Godetia (Lady Albemarle), Eupatorium argeratoides, Zinnia elegans gloriosa, Sesbania macrocarpa, Coneitivis rowgides, Diplagium arborescens, Careus Zamæavus, Craspedium repens, Euphorbia acanthothamus, Euphorbia grandiflora, Eryngium Wrightii, Gynandvivia neyvindium, Gossypium pumelianum, Gossypium vovycatum, Gossypium cornutum, Gossypium Wightianum, Gossypium verbaceum microcarpum, Gossypium microcarpum, Gossypium hirsutum intermedium, Gossypium hirsutum, Gossypium microcarpum miniata, Gladiolus inpestus, Linnia calva, Stephans pleynum pulchellum, Notelia rigida, Oldama imbricata, Perilla occidentale, Parvatropia teymoiniana, Parvatropia scandens, Parvatropia favisnifeas, Zephyranthus Lindleyana, Zamium arborescens, Cordyline canæfolia, Cordyline canæfolia "narrow-leaved," Erythrina verpertis, Jasminum simplicifolium, Lespedeza cuneata.
From BUSSEY INSTITUTE, Jamaica Plain, Mass.:
Species of bulbs—Muscaria (Saxifriga) pulcherima, Milla laxa, Ixia crosata, Bodia coccinea, Nesine curvifolium, Loshenolia tricolor, Ornithagalum natas, Ornithagalum ———, Sparaxis tricolor, Gladiolus, sp. Cape of Good Hope, Ixia annetia, Fresia Siash —— Colchicum speciosum, Hesperoscardum crystalinum, Tritonia brilliant, Tritonia squalida, Sparaxis Californica, Tritonia lineata, Milla hyacintha, Tritonia miniata, Oxalis flava, Colochortus pulcellus, Nesine crispa, Amaryllis crispa, Hyacinthus candicans, Milla uniflova, Calochortus venustus, Camassia esculenta, Gladiolus byzantinus, Tritonia eximia, Bridiæa grandiflora.

Greenhouse Plants—Drosera filiforimis, Sarracenia flava, Sarracenia Drummondii, Sarracenia varıolaris, Yucca Bassala, from Japan (Liliaceæ), Semperirvum Fimbriatum, Cyperus Iria, Sempvivum patens, Iris sp. Sandwich Islands.

Hardy Plants—Viola striata, Viola conuti, Saxifraga cordifolia, Omhalodes verna, Iberis sempervirens, Trollius Asiaticus, ———, Epimedium alpinum, Artemesia frigida, Papaver orientalis, Artemesia pontica, Coreopsis rosea, Heuchrea cylindrica, Lychnis viscaria superba, Heuchera villosa, Allium mollis, Ajuga reptans, Hibiscus Moschentos, Dianthus deltoides, Aubretia deltoides, Campanula turbinata, Arabis alpina var., Lilium tigrinum fl. pl., Liatris pyriostachia, Trifolium panonicum, Lilium longiflorum, Veronica pulchella, Funkia Sieboldii var. Centrathus rubra, Corema Conradii, Arenaria graminifolia, Anemone Japonica, Rumex sanguinea, Hibiscus militaris, Elymus glaucophyllus, Crambe cordifolia, Eupatorium aromaticum, Anthesisum liliostrium var. Fraserii, Conium variegatum, Astragalus conadens, Chelidonum majus fl. pl. Statice latifolia Salvia lyrata, Wolenbergia grandiflora, Calystegia sepium, Anemone pulsatilla, Empemedium rubrum, Vicia sylvatica, Saxifraga repanda, Astragalus verticillatus, Calamantha alpina, Arabis lilacina, Helenium grandiflorum, Papaver pilosum, Eryngium planum, Dianthus crusiatus, Campanula rotundifolia, Salvia Japonica (Germany), Veronica caudata, Heuchera pilosissimia, Anemone sylvestris, Arabis vernus, Vicia amphicarpa, Aletris farinosa, Cochlearia officinalis, Hibiscus species (Japan). Gymnotrix caudata, Lunaria rediusa, Cardamine hirsuta, Habenaria blephariglottis, Erigeron glaucum, Aquilegia lactifera, Stokesia cyanea, Crambe filiformis, Cheiranthus alpinus, Sempervivum lestrum, Iris setosa, Spiræa digitata, Teucrisum pyrenalsum, Andropogen schinoperis, Saxifraga longifolia, Primula cortusoides, Scutellaria macrantha, Kinfophia inconvenii, Aquilegia jucunda, Silene Italica, Hedysarum boreale, Aquilegia glandulosa, Smilax mauritanica, Silenia quadrifolia, Asperula hystrix, Arabis verna, Orobus lathyroides, Scutellaria Japonica, Iris sp. (St. Petersburgh), Sedum maximowizi, Ferula communis, Statice tartarica, Arabis ciliata, Sibbaldia procumbens, Potentilla pyrenaica, Conium divaricatum, Adenophora denticulata, Saliva dealbata, Melissa officinalis, Penstemon digitalis, Iris lurida (stenopetala), Asparagus capensis, Silene viridifolia, Stokesia cyanea, Campanula alariæfolia, Agrimonia sp. Arabis turita, Sempervivum tictorum glaucum, Cynthia dandelion, Carduus crispa, Mediola asparagoides, Helenium bracuyglossum, Iris stenogyra, Sedum nevii, Allium Stevenii, Dianthus cruciatus, Dipsacus laciniatus, Saxifraga cæspitosa, Gentiana Andrewsii, Anchusa augustifolia, Asphodeline taurisa, Bignonia alba lutea, Asparagus capensis, Crepis aurea, Iris retusa, Andropogon argentia, Campanula macrantha, Arabis borealis, Arabis rosea, Inula Thapsoides, Dianthus viscidus, Hedysarum sibiricum, Sedum hybridum, Alyssum geomense, Potentilla verna, Saxifriga sporihemisa, Englemannia pinatifida, Rudbeckia Californica, Aubrietia alympisa, Scutellaria minornona, Lappa tomentosa, Allium fragrans, Allium sphærocephalum, Hemerocallis gramniea, Incavilla sinensis, Delphinium cheilanthum, Ameria maritima, Potentilla rupestris, Scrophularia chrysantha, Anchusa sempervirens, Penstemon pubescens, Lychnis leuno, Tigridia speciosa, Tigridia conchiflora, Aster leucanthus, Everbearing Mexican strawberry, Sedum purpurascens, Pyrethrum car-

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neum, Pyrenanthemum lanceolatum, Tigridia pavonia, Aquilegia cœrulia, Mitella Brewerii, Iris virginica, Potentilla multifida, Lobelia syphylitica, Gentiana pneumonanthe, Nepeta nuda, Inula squarrosa, Sedum maximum, Iris aurea, Helonias bullata, Hyacinthus candicans, Gentiana acaulis, Iris lurida var. stenopetala, Iris sp., Armeria elongata, Iris ochroleucra, Saxifraga cordifolia, Asphodeline erelisa, Aster peregrinus, Allium cernuum, Ligularia Siberica, Heuchera pilocissima, Sabatia chloroides, Sedum Fabaria, Nephita muscina, Saxifraga geum, Arabis bellidifolia, Ampelopsis veitchii, Allium fistulosum, Iris spinosa Siberica, Heliopsis sp. (Mexico) Ptarmica impatiens, Allium carinatum, Allium senescens, Iberis Gibraltarica, Calycanthus lævigatus, Saxifraga peltata, Calycanthus floridus, Artemesia ludovciana, Gypsophylla scrozonerafolia, Stellaria holostea, Arabis albida, Hibiscus militaris, Hydrangea quercifolia, Spiræa filipendula, Zanthorhiza opulifolia, Spiralea armicus, Salvia Pitcher (Texas), Aquilegia chrysantha (new yellow columbine), Œnothera Missouriensis (Texas), Marshallia cæspitosa (Texas), Asclepias incarnata, Thermopsis Montana (Oregon), Lentillaria lateriflora, Desmodium Canadense, Hydrophyllum capitatum (Oregon), Anemone multifidum (White Mts.), Rhexia virginica, Gundella squarrosa (Texas), Guitienezia Texana, Mentzelia ornata perpureum.

From J. A. Foote, Terre Haute, Ind.:

1 pkg. Green Fringed Lettuce.
1 pkg. 100 Day's Tomatoes.
Pkt. Seeds of Hybrid Dwarf candytuft.
Gooddia Lady Albermarle.
Pansy, finest mixed.
Phlox Drummondii.
Spanish monstrous Pepper.
Terre Haute Nutmeg Melon.

From Rural New Yorker:

Tomato, Golden Trophy. Aquilegia Bebb's Hybrid. Musk Melon, Surprise Monmouth. Onion, Creole. Tomato, Early Dwarf French. Aquilegia truncata. Cauliflower, Earliest Algiers. Improved Brussells Sprouts. Rumex sagittatus.

From Landreth & Son:

Package Turnip Seeds.

From Pres. W. S. Clark, Amherst, Mass.:

1 package Sciadopitys Verticillata (umbrella pine) from Japan. One of the finest conifers. Hardy in Massachusetts.
1 package Large Magnolia from forest of Yezo.
1 package Erythronium grandiflorum (red), a beautiful spring flower of Yezo, Japan.
1 package Kokuwa actinidia polygama, a twining, woody vine of Yezo, Japan.
1 package Katrusa, a very large tree of Yezo, Japan, with timber like tulip tree. All the above are seeds.

From Chas. Bingham, General Agent, Lock Haven, Penn.:

1 package of "The Virative Compound."

From Hon. E. S. Moore, of Three Rivers:

Specimen of Alfalfa, from Lower California.
Specimen of Alfillere, from Lower California.

DONATIONS TO THE LIBRARY.

From SMITHSONIAN INSTITUTION:
Annual Report 1876.
From U. S. AGRICULTURAL DEPARTMENT:
Annual Report 1876.
From U. S. BUREAU OF EDUCATION:
Circulars, Nos. 1 and 2, 1877.
Special Report on Medical Education, 1776—1876.
Annual Report 1873.
" " 1876.
From U. S. TREASURY DEPARTMENT, BUREAU OF STATISTICS:
Quarterly Report to Sept. 30th, 1877.
From U. S. DEPARTMENT OF INTERIOR:
Tertiary Flora, U. S. Geological Survey.
Bulletin U. S. Geological Survey, Vol. IV., 1 and 2.
Bulletin of National Museum, No. 10.
Land Office Report 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877.
House Journal, 2d Session 44th Congress, and 1st Session 45th Congress.
Senate Journal, 2d Session 44th Congress, and 1st SessionCongress.
Form U. S. NAUTICAL ALMANAC OFFICE:
American Ephemeris and Nautical Almanac, 1880.
From U. S. LIGHT-HOUSE BOARD:
Light-house list, Atlantic.
Light-house list, Lakes.
Reynaud's Memoirs upon Illumination of Coasts of France.
Reports, 1876, 1877.
From U. S. WAR DEPARTMENT:
Roll of Honor, 26 vols.
Paymaster General's Report 1876–7.
Army Register, June, 1877.
Descriptions of Military Posts.
Wagon Harness.
Hints on Horseshoeing.
Army Register, 1878.
From U. S. WAR DEPARTMENT, SURGEON GENERAL'S OFFICE:
Circulars Nos. 3, 4, 8 and 9.
Catalogues of International Exhibitions, Medical Department U. S.
Models of Hospitals.
Models of Steam Vessels.
Models of Steam Cars.
Models of Carts.
Catalogues of Medical Museums.
Catalogue of Skeletons.
Surgical Section.
Medical Section.
Microscopic Preparations.
Comparative Anatomy.
From OFFICE OF CHIEF OF ENGINEERS, U. S. A.:
Expedition up the Yellowstone. Forsyth.
Nebraska and Dakota, 1855–6–7. Warren.

Reconnoissance of the Black Hills. Ludlow.
Yellowstone Expedition, 1870. Doane.
Expedition from Santa Fe. Macomb.
The Great Basin of Utah. Simpson.
Carroll to Yellowstone Park. Ludlow.
Compressive strength of Building Stone. Gilmore.
Influence of Forests on Rainfall. Valles.
Annual Report, 1875, 1876, 1877.
Map of Battlefield of Gettysburg (three sheets).

From ORDNANCE BUREAU, U. S. A.:
Report of Chief, 1877.

From CHIEF SIGNAL OFFICER, U. S. A.:
Suggestions, 1877.
Report, 1877.

From HON. I. P. CHRISTIANCY, U. S. S.:
Report of U. S. Commissioner of Agriculture, 1876.
Diseases of Swine and other Domestic Animals, 1878.
Congressional Record, Vol. V. [extra sess. 44th Cong.], parts 1-4 and index.
Congressional Record, Vol. VI. [extra sess. 45th Cong.]
Report of U. S. Commissioner of Agriculture on condition of the crops, July 1, 1878.

From HON. M. S. BREWER, M. C.:
Congressional Record, Vol. VI. [extra session 45th Cong.]
Congressional Record, Vol. VII. [2d sess. 45th Cong.], Parts 1-5 and index.
Message and documents, abridgment, 1877-8.
Speech of Hon. J. A. Garfield, March, 1878.
Report of Commissioner of Agriculture on diseases of domestic animals, 1878.
Report on Forestry, 1877. F. B. Hough.
Message and documents, Navy Department, 1877-8.
Message and documents, War Department, 1877-8.

From SECRETARY OF STATE, Michigan:
Public Acts, 1877.
Local Acts, 1877.
Joint Documents 1876, Vols. 1, 2, 3.
Report of Commissioner of Railroads, 1876.
House Journal, 1877, Vols. 1, 2.
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From STATE SUPERINTENDENT OF PUBLIC INSTRUCTION, Michigan:
Report, 1876.
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" " New Jersey, 1877.
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Transactions of Wisconsin Agricultural Society, 1878.
Transactions of Wisconsin Horticultural Society, 1878.
Report of Western New York Horticultural Society, 1878.
Report of Ontario Fruit Growers' Association, 1876, 1877.
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Michigan Flags.
From STATE AGRICULTURAL SOCIETY of Michigan:
Memorie Del Accademia D'Agricultura, Asti E. Commercio De Verona, Vol. LV.
From SECRETARY OF MASSACHUSETTS HORTICULTURAL SOCIETY:
Schedule of Prizes, 1876, 1877, 1878.
Transactions, 1876, 1877, 1878 (Part 1).
From BUSSEY INSTITUTION, Harvard College:
Bulletin (Vol. II., Part III.), 1878.
From SECRETARY OF CONNECTICUT STATE BOARD OF AGRICULTURE:
Report of State Agricultural Society, 1855.
Report of State Board of Agriculture, 1877.
From DIRECTOR OF CONNECTICUT EXPERIMENTAL STATION:
Report, 1877.
From COMMISSIONERS OF PENNSYLVANIA STATE GEOLOGICAL SURVEY:
Beport of Second Geological Survey of Pennsylvania, Vols. HHH., II., KK.
From SECRETARY OF OHIO STATE BOARD OF AGRICULTURE:
Report, 1876.
From COMMISSIONER OF AGRICULTURE, Kentucky:
Report of Agriculture and Resources of Kentucky, 1877.
From COMMISSIONER OF AGRICULTURE, Georgia:
Result of Soil-tests of Fertilizers, 1877.
Monthly Reports of Crops, etc, 1877–8.
Report, 1877.
Manual of Georgia for Immigrants, 1878.
From SECRETARY OF ILLINOIS STATE AGRICULTURAL SOCIETY:
Transactions, 1875, 1876, 1877.
From ILLINOIS INDUSTRIAL UNIVERSITY:
Report 1870, 1871, 1872, 1873, 1874.
From SECRETARY OF KANSAS STATE BOARD OF AGRICULTURE:
Report, 1876.
Monthly Reports of Crops, etc., 1877–8.
From MESSRS. GINN & HEATH, Boston:
Allen & Greenough's Latin Grammar.
From PROF. N. H. WINCHELL, State Geologist of Minnesota:
Fourth Annual Report, 1875.
From ESSEX INSTITUTE, Massachusetts:
Bulletin.
From TOWNEND GLOVER, Author:
Manuscript Notes; Entomological Index, 1877.
From SEVENTH DAY ADVENT TRACT SOCIETY:
Thoughts on Daniel. Smith.
Thoughts on the Revelation. Smith.
The Sanctuary and its Cleansing. Smith.
Man's Nature and Destiny. Smith.
The Spirit of Prophecy. Mrs. White.

Life of Wm. Miller. White.
From F. W. CHRISTERN, New York:
Rankine's Machinery and Mill Work.
From H. S. RODGERS, Author:
History of Cass County, Michigan.
From PROF. S. W. JOHNSON, Yale College:
Some Reasons for Tillage.
From F. S. KEDZIE, Lansing:
History of Lansing Reform Club, by Rev. George Duffield, D. D.
From PROF. R. C. KEDZIE, College:
Healthy Homes for Farmers.
Relative Food Value of Different Varieties of Michigan Wheat.
From PROF. GEO. T. FAIRCHILD, College:
Proceedings of Industrial Department of the National Educational Association. 1877.
Annual Proceedings of Michigan State Medical Society, 1873, 1874, 1875, 1876.
Official Catalogue of Centennial Exhibition. Parts 1, 2, 3, and 4.
Cost and Price in Farm Products.
A Practical Education, &c.
From PROF. A. J. COOK, College:
Cook's Bee Manual, Second Edition.
From PROF. W. J. BEAL, College:
Numerous Catalogues of Seeds, Plants, and Garden Implements.
From the several publishers have been received the following periodicals:
American Rural Home.
The Grange Visitor.
Michigan Farmer.
Prairie Farmer.
Practical Farmer.
Scientific Farmer.
Southwest Farmer.
The Husbandman.
Rural New Yorker.
Western Rural.
Globe and Canada Farmer.
Farmers' Review.
Farm and Fireside.
Western Agriculturist.
Chicago Live Stock and Produce Reporter.
Gleanings in Bee-culture.
Bee-keepers' Magazine.
Boston Journal of Chemistry.
Browne's Phonographic Monthly.
Young Folks' Rural.
Church Union.
American Missionary.
Foothill Weekly Tidings, California.
Also the following Michigan newspapers:
Allegan Journal.
Ann Arbor Michigan Argus.
Battle Creek Journal.

Charlotte Republican.
Clinton County Republican.
Coldwater Republican (semi-weekly).
Flint Wolverine Citizen.
Grand Rapids Times.
Grand Rapids Saturday Evening Post.
Grand Rapids Greenback.
Hillsdale Standard.
Ingham County News.
Kalamazoo Telegraph.
Lansing Journal.
Lansing Republican (semi-weekly).
Midland Independent.
Monroe Commercial.
Newaygo Tribune.
Pontiac Bill Poster.
Romeo Observer.
Sanilac Jeffersonian.
Sturgis Journal Times.
Traverse Bay Eagle.

The above have been received regularly for the whole or greater part of the year. Occasional copies of other papers have been received, among which are:

The Benzie County Journal.
Our Home Journal, New Orleans.
The National Advocate, New York.

From the AMERICAN UNITARIAN ASSOCIATION:
The Religious Magazine.
The Christian Register.

From UNITED STATES PATENT OFFICE:
The Official Gazette.

From MRS. PRATT, Lansing:
The Woman's Journal.

From PRESIDENT ABBOT:
The New York Evening Post (Semi-weekly).
The New York Independent.
The New York World.
The Weekly Scotsman.
The Springfield Republican.

From PROF. FAIRCHILD:
The Advance.
Harper's Weekly.
The Oberlin Review.
The Literary World.

From PROF. BEAL:
The American Cultivator.
The Chicago Journal.
Ann Arbor Courier.

From PROF. CARPENTER:
Ann Arbor Register.
Detroit Free Press (Daily).

From PROFESSOR INGERSOLL:
American Live Stock Journal.

From SECRETARY BAIRD:
The American Farmer.
The New England Farmer.
The Chicago Inter-Ocean.
From Mr. JAMES CASSIDY, Gardener:
The London Times (Weekly).
From C. J. STRANG, Student:
The New York Tribune.
From F. W. HASTINGS, Student:
The Educational Monthly.

TO THE MUSEUM.

Name.	Locality.	No.	Donor.
Geodes	Keokuk, Ia.	46	O. Clute.
Indian relic	Lenawee Co.	1	H. Hamlin.
Ammonite	Grayson Co., Texas	1	E. B. Knapp.
Favosites favosus	Pt. Detour, L. Huron	8	State Geological Survey.
Favosites obliquus	" "	4	" " "
Favosites venustus	" "	2	" " "
Favosites Hamiltonensis	Petosky	2	" " "
Favosites placenta	Thunder Bay	2	" " "
Halysites catenulata	Pt. Detour, L. Huron	3	" " "
Strombodes striatus	" "	2	" " "
Strombodes pentagonus	" "	1	" " "
Cyathophyllum Houghtoni	Petosky	4	" " "
Cyathophyllum Scyphus	Alpena	3	" " "
Cyathophyllum Davidsoni	Petosky	2	" " "
Alveolites Niagarensis	Pt. Detour, L. Huron	2	" " "
Diphyphyllum archiaci	Alpena	1	" " "
Syringopola verticellata	Pt. Detour, L. Huron	1	" " "
Atrypa reticularis	Petosky	5	" " "
Atrypa reticularis	Trowbridge's Mills	40	" " "
Cyrtina umbonata	Thunder Bay River	1	" " "
Stromatopora	Pt. Detour, L. Huron	3	" " "
Stromatopora cespitosa	Petosky	1	" " "
Stromatopora pustulifera	"	1	" " "
Stromatopora minuta	Pt. Detour, L. Huron	1	" " "
Stromatopora	Middle Island	1	" " "
Stromatopora monticulifera	Petosky	1	" " "
Fistulipora spinulata	Alpena	5	" " "
Spirifer mucronatus		16	" " "
Spirifer granuliferous	Alpena	5	" " "
Strophodonata demissa	"	24	" " "
Bituminous shale	Petosky	1	" " "
Atrypa reticularis	Ohio	3	President Orton.
Clinton Limestone (97 per ct.)	"	1	" "
Strophomena planumbona	"	1	" "
Orthocerata	"	2	" "
Chaetetes lycoperdon	"	2	" "
Waverly Iron Ore	"	1	" "
Strophomena alternata	"	4	" "
Rhynchonella capax	"	4	" "
Ambonychia radiata	"	1	" "
Modiolopsis modiolaris	"	1	" "
Orthis biforata	"	8	" "
Orthis insculpta	"	5	" "
Orthis testudinaria	"	12	" "
Orthis subquadrata	"	3	" "

Name.	Locality.	No.	Donor.
Orthis occidentalis	Ohio	2	President Orton.
Rhynchonella perlamelloso	"	4	" "
Cyclonema bilix	"	5	" "
Petraia corniculum	"	3	" "
Strophomena planumbona	"	4	" "
Strophomena sulcata	"	2	" "
Strophomena nutans	"	3	" "
Leptæna sericea	"	3	" "
Crinoidal stems	"	8	" "
Zygospira modesta	"	9	" "
Fossiliferous rock	"	1	" "
Protarea vetusta	"	1	" "
Stellipora antheloidea	"	1	" "
Chætetes momatatus	"	3	" "
Microcerous Inonatus	"	1	" "
Chætetes Dolii	"	3	" "
Orthis Carllyi	"	1	" "
Bellerophon bilobatus	"	1	" "
Water-lime	"	1	" "
Chætetes grasolis	"	6	" "

DONATIONS TO THE APIARY.

From T. F. Bingham, of Allegan:
Three Smokers.
From L. C. Root, of New York:
A Quinby Smoker.
From J. H. Nellis, of New York:
One Bee Hive.
From G. M. Doolittle, of New York:
One Bee Hive.
From McCall and Williams, Schoolcraft:
Bee Hive.
From A. J. King, of New York:
One Feeder.
From A. J. King, of New York:
One Atomizer.
From J. M. Shuck, Iowa:
One Feeder.
From Sperry & Chandler, Minnesota:
One Bee Hive.
From C. O. Hetherington, East Saginaw:
Bee Hive.
2 lbs. Foundation.
From B. O. Everette, Toledo:
Extractor.
From Rudolf Mayerhoffer, Prague, Austria:
Seeds from twenty varieties of bee-plants.

SUPPLEMENTARY REPORT OF THE PROFESSOR OF AGRICULTURE.

To the President:

In writing this supplement I will begin with the report of the expenditure for steam power which was concluded in this year (1878–9.) The money for motive power was to have been expended in connection with steam power at the boarding hall; but a change in plans there obliged us to expend the money independently.

After correspondence with several parties, we concluded to accept the proposition of James Leffel & Co., Springfield, O., and accordingly purchased a 6½ horse-power engine of their manufacture. It was then planned to have it placed away from the barns, so as to avoid all possibility of danger from fire. It was placed 400 feet distant and east from the main barn, and 310 feet from the nearest shed, connected with the barns. A small building 10 by 14 feet was built to receive it.

The power is transmitted to the barns by means of an endless wire rope 7-16 inch in diameter, over two large iron sheaves or pulleys, manufactured expressly for such use, 5 feet in diameter.

The rope and pulleys were obtained of John Roebling's Sons, Trenton, N. J.

The engine house is connected with the wind mill tank and water supply by a connection of 23 feet of gaspipe, which with proper stopcocks controls the supply of water to the engine, and at the same time taps the tank for the purpose of wetting down the newly formed compost heap of the horticultural department which is near, in a dry time. If the well now pumped by wind-mill, proves to be of sufficient capacity, it is proposed to use a rotary pump, which can easily be attached to the shafts in the engine house, and abandon the windmill at that point (as it is getting somewhat worn) when it may finally give out. This change caused the purchase of a 6-foot shaft for the driving power in the engine house with one 30-inch pulley; also the purchase of 28 feet of shaft for the main barn with one 4-foot pulley and two 2-foot pulleys. The former drives our thresher, or the No. 4 Cummins cutter. One of the latter drives combined Challenge feed mill (with shelling attachment). This is set in the room known as the east granary.

By cutting through and putting in an outside door, we are enabled to deliver loads of corn within 10 feet of the sheller, and unload in bin prepared to receive it, while a pipe from the grinder conducts the meal below below into a bin with capacity of 75 bushels, which is on the same floor with the stables and but a few feet removed from them, thus rendering the feeding very convenient. The handling, both of corn and feed when ground, is thus reduced to a minimum. The remaining pulley drives a shaft in the basement (which was in use before), and this in turn drives the pulper or grater for roots.

Our engine furnishes us the power and we are able by the above arrangement of shafts, pulleys and belts, to thresh, to shell and grind, and cut feed at one time, to grind and pulp roots at one time, or to cut feed and pulp roots at one time.

In this way we have considerable latitude in planning the work to be done in the barns with the machinery.

This supplies a long felt want, and is a great saving in many ways to the department. The old method of using tread power did very well when a small amount of work was to be done, but with our increased amount of stock, we needed the power we now have. The engine and machinery give entire satisfaction.

The account of expenditure is as follows:

To engine,	$310 00
Freight from Springfield,	14 61
Cost from town and setting up,	8 00
Two 5-foot pulleys for wire rope,	75 60
820 feet wire rope spliced,	48 32
Freight on rope and pulleys from Trenton,	6 84
Cost of shafts and pulleys with hangers and boxes, etc., etc., also labor in putting up,	133 87
Cost of engine house, lumber, labor, &c.,	69 82
Extra belt, oil cans, &c.,	16 57
Alterations at the barns, door cut through, bin made, etc., etc.,	22 07
Total	$705 70

The engine, wire rope and 5 foot pulleys were purchased at from 10 to 12½ % discount from regular prices,

With this new arrangement we are able to grind from 50 to 60 bushels of ground feed (corn and oats) in 5 hours or one-half day. This saves us nearly $2.00 for each half day we grind, when compared with the old way of going 3 miles to town to mill, and paying toll, or for the grinding at the rate of 5 cents per bushel. The cobs from the shelling of the corn furnish nearly one-half the fuel for the engine.

CORN HOUSE.

The expenditure of funds for corn house, was ordered for the first work of this year (1878–9).

A house has been erected 24 by 40 feet in size, with 16 feet posts. There are two cribs, 6 feet in width and 12 feet high, one on either side of the building, thus leaving a drive way of 12 feet in width with plenty of storage room above. This furnishes crib room for over 4,000 bushels of ears with room for 1,000 more above.

The building is put upon a good stone foundation laid in mortar with piers under the center. Small sections of the wall on the sides and ends are left out in order to give free access and passage to currents of air. The building is well ventilated by means of notched work on the side and end studding, leaving an air space of one inch between each two pieces of siding. The slant of the siding tends to force the air, when the wind is blowing from any direction, diagonally across the crib.

There is a funnel shaped ventilator placed on the roof and connecting with the cribs, to assist in inducing currents of air through the corn, when little air is stirring.

The bottom of each crib is an inclined plane, with the joists used as supports notched in such a manner that the bottom boards overlap and have an inch air space in every 10 inches of surface, and no corn can possibly fall through, but must be conducted forward to the opening on the floor of the main drive way. With this arrangement, and taking from the base of the crib each time as from

the bottom of a shute, all the corn above, in the crib, must be moved and, with such movement of the corn, it is claimed by those who have tried it, that vermin are very effectually driven from the crib—that they will not nest and stay where their arrangements are disturbed every week.

The corn is easily loaded under cover in the drive way and moved to any point where wanted for use, or to the granary for grinding.

The doors to the drive way are 6 feet wide and are upon rollers, opening each way, and when open just cover the space to the outside of the building allotted to cribs. This enables the doors to be thrown open to drive through, or they may be left open for purpose of better ventilation of the interior, without any danger of doors being torn off or being otherwise injured, as they are entirely out of the way. The drive-way is planked, and may serve to store some of the larger farm implements when not in immediate use for drive-way, while the upper floor can be used for smaller implements if not used for corn.

The cost of construction, with one coat of paint, is as follows:

To mason work on foundation	$12 94
lime	4 00
lumber	194 66
paint and oil	7 00
mechanic's labor	74 00
student "	39 72
one window, 2 sash, glazed, 12 by 14	1 75
hardware, nails, etc.	18 19
men and team labor, hauling stone and grading for foundation,	24 30
freight on lumber from Coral	39 64
	$417 00

There were 10 perch of stone used of those that were on hand, worth 87½ cents per perch.

The lumber was purchased by the car-load at Coral, Montcalm county, and thus a saving of from three to four dollars per M. was made on the material. The students have performed 496½ hours' labor on the building, under the charge of the mechanic. The building was some larger than will be essential at present, but when three or four new fields are brought under cultivation, as they soon will be, all the room will be needed, and perhaps more.

EXPERIMENTS—WHEAT.

In my report as Professor, in 1877, I mentioned the fact that I had sown thirty varieties of wheat, for experimental and educational purposes. These plats were noticed for work that the Hessian fly had done, and I do not know as I can better give the result than to copy the article entire, as written by me in July and published in several of the State papers.

AGRICULTURAL COLLEGE WORK.

EXPERIMENTAL WHEATS AND THE HESSIAN FLY.

In 1876, the Agricultural College received (too late for sowing) several varieties of wheat from David Landreth and Sons, Philadelphia.

These were sown in field No. 2 on the farm, September 14–16, 1877, this field lying beside the Lansing and Howell Gravel road. The west portion was sown to Arnold's Gold Medal, while the eastern portion of the field was sown

to a tender variety of Asiatic wheat. This variety was presented to the college in 1875 and sown that year, yielding only 7½ bushels per acre, while other varieties yielded 15 to 17½ bushels per acre on the same field, and with the same conditions surrounding them. It was sown again in 1876, and in 1877, yielding 17 bushels per acre, while Arnold's Gold Medal by its side, yielded 35 bushels.

It was determined that we should try it once more, and see if by continued sowing it would not become more hardy, and thus become a valuable acquisition to our list of white wheats. It was accordingly sown as stated above.

The experimental varieties were sown at the south side of the field, and were bounded on two sides by this Asiatic wheat. The plats were sown with four rows or drills 8 inches apart and 30 feet long, a path four feet in width running around each plat.

These plats were sown in order to observe the character and growing qualities of the varieties, as well as to furnish our students with an opportunity to see and study the different wheats during the period of growth; and to their credit be it said, that more than three-fourths of the students have visited the plats from the time the heads began to appear, many coming every three or four days to observe the difference in growth,—a few tried hybridizing some of the varieties. Several have asked for sample heads from the plats for a collection of wheats to preserve.

That these plats were admirably situated to make comparisons will be shown by the havoc the Hessian fly made in the Asiatic wheat, which I have mentioned as lying beside the road and bounding these plats on two sides. The soil was rather light loam underlaid by a stratum of hard blue clay, the loamy or sandy soil being the best place for the insect to work.

Oct. 1.—Asiatic wheat up and looking as well as any wheat upon the farm.

Oct. 26.—The Hessian fly has been at work so that in many places over 50 per cent of the wheat has been destroyed.

The warm rains, however, may help matters some, as new tillers or shoots are sprouting from those plants not eaten off below the crown.

Nov. 25.—The wheat has improved in appearance wonderfully since the last observation, but the new shoots are not strong.

Plenty of larvæ in the pupa or flax-seed state in almost every stool.

April 5.—Field much improved in appearance; wheat growing well.

Many places where there is not a wheat plant or stool in 18 inches distance in the drill rows.

May 30.—Saw several heads of smut.

June 4.—The field showing smut in large quantities,—the larvæ of Hessian fly numerous.

June 31.—Out of 38 consecutive stalks at one examination found larvæ, these being from a single stool of wheat. Larvæ in all heads that showed smut, as far as observed, and in some others,—fifteen larvæ found in a single stalk and 103 in a single stool of wheat.

July 10.—Harvested, and more than 50 per cent of what was growing in the spring, cut down by the Hessian fly. The field is scarcely one-fourth a crop.

You will thus see that the plats were side by side, with a field with over three-fourths of the crop destroyed, and in no case were the plats more than 40 feet from the poor field of wheat.

The Gold Medal wheat was injured by about 25 per cent in the fall,—the Treadwell by about 35 per cent, and the Clawson not at all.

Part of the Gold Medal and Treadwell were sown on the clay hill west and

north of the President's house, after wheat of the previous year. This may have had an influence on their work for this year, and made them worse on that particular piece of ground. Wheat was sown after wheat in order to work and smooth the ground more, preparatory to seeding it down in meadow or lawn.

I have compiled the following table of work of the Hessian fly, from observations conducted myself or under my immediate supervision. The first column shows the per cent destroyed as observed and computed Nov. 25, 1877.

The second and third colums show the number of larvæ found in 30 stalks selected from three different places in each plat, as observed June 14, and some that were duplicated on June 26.

As a general observation, we might say that the ground on which these plats of grain were situated was much too poor, and entirely unfitted for best results in wheat raising:

VARIETY.	Per Cent.	Larvæ June 14.	Larvæ June 26.
Asiatic	55	......	......
Red May	70	30	......
Mediterranean	18	5	4
Louisiana	70	209	72
Kentucky	40	68	......
Tappahannock	35	58	22
Shumaker*	5	1	0
Post	2	42	8
White Rodgers	20	52	......
Silver Chaff	20	49	......
Victoria	45	136	......
Amber	5	71	......
Trump	2	101	......
Jenning's White	0	0	13
Rough Chaff†	15	94	......
Lammas	25	156	......
Dott	0	3	......
Michigan Wick	0	4	......
Russian	3	2	0
Muskingum	0	10	......
Arnold's Hybrid	0	0	0
Fultz	0	3	......
Nursery	5	17	19
Treadwell	40	43	......
Hertz's White	42	......	......
Deihl	8	27	......
Arnold's Gold Medal	15	71	189
Clawson	10	73	......
Field Clawson ‖	0	......	18
Grecian White §	0	83	......
Red Russian	0	30	......
Childham ¶	0	43	......

* Very good. † Very few heads. ‖ Two observations. § Poor. ¶ Very few heads.

The inference cannot be drawn from the foregoing that some varieties are insect proof or nearly so. We can infer that where there are several varieties of wheat growing side by side, some varieties seem to be preferred to others.

The last three varieties mentioned in the table, were sown October 25, too late for the work of the fall brood of Hessian fly.

It has been very interesting to watch the development of these varieties and see how they have conducted themselves under the ordeal.

Some varieties fall down at once when the grub or larvæ begins its work; others stand erect but the blossoms seem to blast, as there will be no filling of the head and no grains produced

Other varieties have produced shrunken grain, the straw standing erect to the time of harvest.

These plats have been visited by many farmers in this and adjoining localities, who have evinced a marked interest in the results that were to be reaped by watching their growth and development.

July. 19.—We have threshed out the grain by hand and weighed, with the following results, the same amount of seed having been sown in each instance, viz., one and one-half ounces:

VARIETY.	Weight in oz.	VARIETY.	Weight in oz.
Red May	9	Lammas	8
Mediterranan	43	Michigan Wick	65
Louisiana	17	Russian	35
Kentucky	21	Muskingum	45
Tappahannock	18½	Arnold's Hybrid	53
Shumaker	72	Fultz	68
Post	17	Nursery	33
White Rodgers	20½	Treadwell	42
Silver Chaff (full)	30	Hert's White	13
Victoria	3	Deihl	41
Amber	31	Arnold's Gold Medal	40½
Trump	9½	Clawson	43
Jenning's White	60	Grecian White	3
Rough Chaff	3½	Red Russian	6
Dolt	50½	Chidham (estimated)	1

The yield per acre was as follows, for some of the leading varieties: Shumaker, 40.8 bushels; Fultz, 38.5 bushels; Michigan Wick, 36.88 bushels; Jenning's White, 34 bushels; Mediterranean 24.88 bushels; Treadwell, 23.8 bushels; Deihl, 23.3 bushels; Arnold's Gold Medal, 23 bushels; Arnold's Hybrid (red), 30.1 bushels; Muskingum, 25.5 bushels; Clawson, 24.88 bushels.

The remaining varieties varied in yield from 9.85 bushels to 20 bushels: most of them below ten bushels. The yield of the last three should not be compared with the others on account of late sowing. The others were sown at the same time.

C. L. INGERSOLL.

I have sown most of these varieties again in experimental plats, in a much better place, but the comparative yield will be of little value, as a defective hand-drill did not deposit the seed in even quantity on each plat. The interest manifested in this question of wheats has brought me quite a large correspondence. I have received letters from Nova Scotia to Missouri, and as far as Texas in the South and West, with regard to these varieties I have sown, the reports in our State papers having been copied far and wide. Prof. Tracy, of the Agricultural Department of the Missouri State University, Columbia, Mo., writes that he has experimented with several of these varieties and report of their yields with him is relatively nearly like ours. Mr. C. E. Thorn, farm manager and experimenter under Dr. Townshend, of the Ohio Agricultural College, reached results nearly like our own. I have this year added several new varieties, through exchanges with other colleges and by individuals.

I have sent some varieties to Prof. Tracy, of Missouri, some to Illinois State University, to Prof. Morrow, and some to Ohio Agricultural College, with smaller samples to various individuals in our own State.

I have also received from Pennsylvania Agricultural College two bushels of Shumaker wheat, to try in quantity, as that seemed to promise so well this year. The following is a list sown in plats this year:

WHITE VARIETIES.

Clawson,	Deihl,	Kentucky,	Louisiana,
Treadwell,	Gold Medal,	Rogers' White,	Herts' White,
Mich. Wick.	Golden Straw,	Post,	Trump,
Tappahannock,	Silver Chaff,	Victoria,	Rough Chaff,
Jennings' White,	Armstrong,	Australian,	Asiatic,
Powers,	Lincoln,	White Rose,	Shaffer,
Lancaster,	Velvet Chaff,	Grecian White,	Buckeye.

AMBER VARIETIES.

Mich. Amber,	Shumaker,	Muskingum,	Russian.

RED VARIETIES.

Fultz,	Nursery,	Red May,	Russian Red,
Mediterranean,	Dott,	Arnold's Hybrid,	Lammas.

I have also received from Mr. Armstrong, of Schoolcraft, several hybrids; also some that Prof. Beal has hybridized. These are as follows:

Armstrong with Lancaster.	Deihl with Egyptian Red.
Deihl with Amber.	" " Treadwell.
" " Lancaster.	Armstrong and Deihl with Treadwell. This is a double hybrid.
Armstrong with White Amber.	
Clawson with Deihl.	Asiatic with Gold Medal.

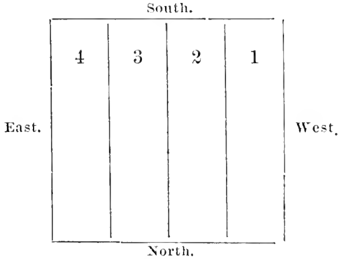
At the request and suggestion of Prof. Beal we have sown the grains in each of two fine heads of wheat, in the same relative order in which they grew in the head. This is done in order to note the growth of the grain from different portions of the head, and compare their growth and the result reached. The arrangement for this and the supervision of it has occupied largely my time.

Besides the above, I have sown Clawson wheat in small plats, side by side, so as to note the work of the Hessian fly on that sown at different times; soil and other conditions were equal, as nearly as possible. These plats were sown respectively on September 6, 9, 11, 13, 16, 18, 21, 24, 27, 30, and October 2 and 5. On October 5 Prof. Cook and myself made a careful and thorough examination of these plats, and found Hessian fly larvæ in each of the plats sown before September 25th, there being fewer as the sowing was later. Those larvaæ in the first two plats were in the flax-seed or pupa state. In that plat sown on September 13 I found 9 larvaæ in a single stool of wheat, and 4 in a single stool of that sown on September 16; less in those plats sown on September 18 and 21. Our field wheat was sown on September 16, 17 and 18, and they were found in that sown on each day, but most in that sown on the first day, or September 16.

These plats will be carefully watched another year, and any changes noted. Also the varieties will be watched with reference to the work of the Hessian fly on each.

SUPERPHOSPHATE ON WHEAT.

Messrs. Jarves & Hooper, of the Michigan Carbon Works, having given me an opportunity to test their fertilizer on wheat, I embraced it and sowed plats as follows:



On No. 1 I drilled in 260 lbs. of superphosphate per acre, using a Champion drill manufactured at Oswego, N. Y., and designed to sew fertilizers with various grains. On No. 2 260 lbs. of superphosphate were sown broadcast by means of a broadcast attachment to drill; the fertilizer thus fell behind the drill, and was a top dressing for the surface. Each plat contains an acre, as registered by the drill. On Nos. 3 and 4 no fertilizer was sown. The plats will each be accurately chained when harvested. The plats were separated by a space of two feet on which no crop is grown, except that the whole field has been seeded to Timothy, and will receive an addition of clover in spring of 1879. The plats on which the fertilizer was sown, on October 22, appeared greener and more luxuriant. An examination as to whether the superphosphate would have any influence in keeping away Hessian fly, showed that it had no influence whatever, as as many larvæ were found in the fertilized as in the unfertilized ones, or in the field in other parts sown on the same day, September 16.

A report of results will appear in next year's report.

FERTILIZER ON POTATOES.

I received some fertilizer from the above mentioned firm in Detroit, manufactured expressly for use on potatoes. I therefore selected a place in field No. 8 and planted 8 plats, each plat being 14 feet wide and 2 rods in length, and containing 64 hills. The rows were 3½ feet apart, and the hills about 2 feet apart in the rows. The variety planted was Brownell's Beauty. Each tuber was cut into 3 to 5 pieces according to its size, and 2 pieces dropped in hill. No manure of any kind had been put upon the land for 4 years. The land was in corn stubble, was plowed, harrowed, marked and furrowed for planting, nearly 2 oz. of the fertilizer (126 oz. on each plat,) were dropped in the furrow, covered slightly with earth, and on this bed the seed was dropped and then covered ordinarily. They were planted on May 22, and plats Nos. 1, 3, 5 and 7 received application of fertilizer at the rate of 742½ lbs. per acre, while Nos. 2, 4, 6 and 8 received none. The plats were cultivated three times during the season and hoed twice, and received precisely the same treatment, as far as was possible. The whole potato crop suffered much from a severe drouth, and these as well as the field crop. This shortened the crop much. I think, from the uniform showing in this experiment, that on poorer soil and an ordinary season, the result might have been far better.

The plat and results are as follows:

East.

	lbs.	oz.		lbs.	oz.
1 P.			8.		
Tops	32	12	Tops	28	2
Pot	52	14½	Pot	51	15½
	85	10½		80	1½
2			7 P.		
Tops	31	15	Tops	39	7
Pot	42	9	Pot	59	2
	74	8		98	9
3 P			6		
Tops	41	13	Tops	36	13
Pot	55	2	Pot	54	13
	96	15		91	10
4			5 P.		
Tops	26	5	Tops	30	0
Pot	37	13	Pot	40	10
	64	2		70	10

North. South.

West.

P. = Phosphate.
Pot. = Potatoes.

The plats 4 and 5 show a lower yield, on account of being crossed by an old bed furrow, and should be compared together, and not with 3 and 6 on the east.

This shows an increase of tops of 16 5-6 %; of potatoes, 7⅓ %; increase of both, taken together, 13⅓%. The potatoes were dug and weighed September 17.

PLASTER ON CORN.

This was a continuation of the experiment begun in 1877. The same amount of land was selected, nine-tenths of an acre, or 144 square rods, and divided into 36 equal plats.

The land was selected in the central part of field No. 5; slope gradual, uniform and toward the south; soil uniform in appearance, except that a strip running across the south two tiers of plats appeared a little darker colored and

richer, but as this affected an equal number of the fertilized and unfertilized plats, it was disregarded.

The ground was plowed April 23d, at a nearly uniform depth of 7 inches, May 13, harrowed east and west; May 14, harrowed northeast and southwest, and in place; May 15, harrowed east and west twice in place, with spring-tooth harrow; May 17, rolled the ground; May 18, marked and planted. The plats were two rods square, containing 4 square rods, and were separated by margins 5 feet in width. The corn was planted four feet apart each way, and there were 64 hills on each plat. Seven kernels of corn were planted in each hill.

Plats Nos. 1, 3, 5, 7, 9, 11, 13, 15, 17, were dressed with plaster, one-half ounce being put in each hill and covered with the corn. The remaining plats received no dressing.

The results are given in the following table of the plats:

NORTH.

WEST. — EAST.

6. C...... 92½ S...... 68½ 161	5. P. P. C...... 78¾ S...... 68¾ 147½	4. C...... 76¼ S...... 60¼ 136½	3. P. P. C...... 84½ S...... 56 140½	2. C...... 84 S...... 67¼ 151¼	1. P. P. C...... 82¾ S...... 65¾ 148½
7. P. P. C...... 87¾ S...... 65¼ 153	8. C...... 72¼ S...... 61 133¼	9. P. P. C...... 78½ S...... 64½ 143	10. C...... 84½ S...... 68¾ 153¼	11. P. P. C...... 84½ S...... 67½ 152	12. C...... 75 S...... 58 133
18. C...... 94½ S...... 69¼ 163¾	17. P. P. C...... 79½ S...... 67¼ 146¾	16. C...... 84¾ S...... 69½ 154¼	15. P. P. C...... 86¼ S...... 64½ 150¾	14. C. .... 88 S...... 72½ 160½	13. P. P. C...... 83¾ S...... 66 149¾
19. P. C...... 95½ S...... 81 176½	20. C...... 66¼ S...... 56½ 122¾	21. P. C...... 79¼ S...... 64 143¼	22. C...... 82½ S...... 70 152½	23. P. C...... 88¼ S...... 72¼ 160½	24. C...... 82½ S...... 64 146½
30. C...... 88¾ S...... 72½ 161¼	29. P. C...... 98¾ S...... 79¼ 178	28. C...... 91¾ S...... 76½ 168¼	27. P. C......100½ S...... 83¼ 183¾	26. C...... 92 S...... 76¼ 168¼	25. P. C...... 89½ S...... 79¼ 168¾
31. P. C...... 72¾ 56½ 129¼	32. C...... 80½ S...... 62 142½	33. P. C...... 76½ S...... 59½ 136	34. C...... 85¾ S...... 69 154¾	35. P. C...... 97 S...... 82½ 179½	36. C...... 88¾ S...... 69¼ 158

SOUTH.

Numbers at upper left corner are number of plat.
P. P.—Plaster in hill.
P.—Top dressed with plaster.
C.—Corn.
S.—Cornstalks.
Other numbers, lbs and fractions of a pound.

On June 3d, plats Nos. 19, 21, 23, 25, 27, 29, 31, 33, 35 were top-dressed with plaster, at the same rate, viz: one-half ounce per hill. On June 24 all the plats were cultivated both ways and, on June 27, corn hoed and thinned to three stalks in each hill, thus leaving exactly the same number of stalks on each plat. July 18, cultivated, and hoed again on August 7. The corn was cut on September 13, husked and corn weighed on October 21, between 1 and 4 P. M., and the stalks weighed October 24, between 2 and 5 P. M.

The aggregate yields were as follows:

9 plats, plaster in hill,	C. 746¼ lbs.
	S. 585½ "
Total	1,331¾ lbs.
9 plats alternating with the above gave, with no dressing	C. 751¾ lbs.
	S. 595 "
Total	1,346¾ lbs.
9 plats, plaster top-dressed	C. 798 lbs.
	S. 657½ "
Total	1,455½ lbs.
9 plats alternating with the top-dressed plats, give	C. 758¾ lbs.
	S. 616 "
Total	1,374¾ lbs.
18 plats dressed with plaster in the two ways, give	C. 1,544¼ lbs.
	S. 1,243 "
Total	2,787¼ lbs.
18 plats with no dressing, give	C. 1,510½ lbs.
	S. 1,211 "
Total	2,721½ lbs.
Loss of P. P. plats over undressed	C. 5½ lbs.
Loss of P. P. " "	S. 9½ lbs.
Total loss of P. P. plats over undressed	15 lbs.
Gain of P. Plats over undressed	C. 39¼ lbs.
" " "	S. 41½ lbs.
Total gain of P. Plats over undressed	80¾ lbs.

The smallest yield of corn was on plat 20. The smallest yield of stalks was plat 3. The largest yield of corn was on plat 27, and the largest yield of stalks on the same plat.

The largest total yield was plat 27. The smallest total yield was plat 20.

The season has been a much more favorable one for corn production than either of the years 1876 or 1877. The yield on the whole plat was at the rate of 34.7 bushels per acre of corn, 70 lbs per bushel, or about 69 bushels of ears,

as farmer's ordinarily compute their crop. This is not nearly as good a yield as the crop in the field surrounding the experimental plats. The corn in the field was drilled in and thinned to 14 inches in the drills, and yielded 56 bushels, of 70 lbs. each, per acre on 18.1 acres.

This experiment will be continued one year more, and the results of the three years compared.

EXPERIMENTAL GRASSES.

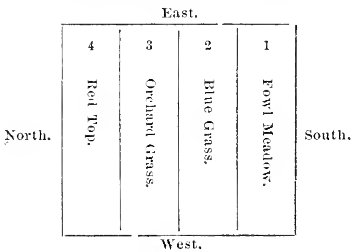
In field No. 10, 4 plats of grasses were sown in the spring of 1878. These plats were two rods by 20 rods in length. They were sowed to Timothy in the fall of 1877. The soil varies from sandy loam on the west to muck in the central part, and then rises on a clay knoll on the east part of each plat. Thus we have all gradations between sand-loam, muck and clay.

These plats were sown as follows:

No. 1 to Fowl Meadow grass.
No. 2 to Kentucky blue grass.
No. 3 to Orchard grass.
No. 4 to Red Top.

The Blue grass and Red Top were looking the best in September, and again in October, when I examined them, The fall has been rather dry, and next spring these conditions may be reversed.

Observations will be made as regards their growth during the next year.



FEEDING EXPERIMENT.

A feeding experiment was planned with a view to seeing about the ordinary keep of Devons and Short Horns. The animals were not to be fattened for beef; hence the feed was not made heavy, for that reason.

They were fed with a ration varying from $2\frac{1}{2}$ to 4 lbs. of dry feed (cut corn-stalks and oat straw) at each feed, 20 lbs. of sliced turnips (Swedes), and 2 quarts feed, morning and evening, consisting of one part each of wheat bran, oat and corn meal. Each animal was fed the same amount at each feed.

The following table shows the result of the experiment for 18 days. The animals were weighed 3 days before the experiment began, and the average of these daily weights taken for the weight when the experiment was begun. They were weighed each day after the morning feed and before watering. The feed that was not consumed was carefully weighed and the total taken from the amount fed in making up the final result:

TABLE OF WEIGHTS.

DATES.	DEVONS.		SHORT HORNS.	
	Clinker.	Clifford.	Hocus.	Hodge.
Jan. 17-18-19—Average lbs.	1,093½	1,196⅔	1,420½	1,357⅔
Jan. 20	1,104	1,203	1,422	1,373
" 21	1,096	1,200	1,410	1,355
" 22	1,098	1,200	1,413	1,363
" 23	1,097	1,202	1,422	1,368
" 24	1,110	1,212	1,413	1,373
" 25	1,100	1,198	1,428	....
" 26	1,108	1,224	1,428	1,401
" 27	1,116	1,224	1,429	1,378
" 28	1,117	1,222	1,443	1,400
" 29	1,113	1,221	1,431	1,388
" 30	1,124	1,224	1,438	1,342
" 31	1,121	1,224	1,435	1,391
Feb. 1	1,121	1,226	1,426	1,378
" 2	1,114	1,222	1,420	1,366
" 3	1,120	1,224	1,414	1,360
" 4	1,130	1,219	1,416	1,374
" 5	1,138½	1,219	1,420	1,372
17 days—Average lbs.	1,113⅓	1,215½	1,424	1,374

The average of all the daily weights is given in the table, as the truest result that could be obtained of the result of the feeding on account of the fluctuations in weight; for ordinary work the last weight only would be considered. Appended is table of feed and gain from the average weights.

TABLE OF FEED CONSUMED.

	DEVONS.		SHORT-HORNS.	
	Clinker.	Clifford.	Hocus.	Hodge.
Dry feed—lbs. consumed less waste	135	122	147	128
Turnips, lbs.	1,020	1,020	1,020	1,020
Qts. Bran	22⅓	22⅓	22⅓	22⅓
Qts. Oat and Corn Meal	44⅔	44⅔	44⅔	44⅔
Gain, lbs. from average	19 5-6	18 5-6	3½	16⅓
Gain from last weight	45	22⅓	-½	14⅓

The result does not give what might be done under better circumstances, when more grain would be fed. The Short Horns did not have enough feed to give them a chance to make best results, while the Devons had about all the feed they would consume. The only change that could be made in their favor in the feed would have been to give more concentrated food.

The weighing of feed and the weighing of the cattle were done almost wholly by Mr. McDowell ; when he could not attend to it, I attended to it in person.

I wish to express my thanks here for the careful and cautious work that both Mr. White, farm foreman, and Mr. McDowell, assistant foreman, have done in connection with the experiments. It has contributed very much toward the carrying them to correct and successful result.

C. L. INGERSOLL,
Prof. Agriculture.

AGRICULTURAL COLLEGE, Dec. 11, 1878.

FARMERS' INSTITUTES.

At the November meeting of the State Board of Agriculture the secretary reported the following applications for Institutes, as having been received and placed on file, viz.:

Bay City,	Charlotte,	Flint,
Battle Creek,	Dowagiac,	Howell,
Centerville,	East Saginaw,	Rochester.

These applications were referred to the committee on Institutes, who reported as follows:

Your committee on Farmers' Institutes present the following report on the Institutes for 1879. In the opinion of your committee it is very desirable that Institutes should be held in those counties where they have not been held previously, until the different sections of the State have been visited.

It is also desirable that the secretary when notifying those parties whose application for an Institute has not been granted, that he state the reason why their request has not been complied with, and also suggest that the application be renewed at some future time.

We recommend that an Institute be held at each of the following places at the times stated, to be attended by the respective members of the college faculty, and to be conducted in the same manner and upon the same conditions as the Institutes of former years, viz., the citizens to bear all the local expenses and to furnish one-half of the lectures and papers:

Bay City, Bay county, attended by Professors R. C. Carpenter, R. C. Kedzie and President T. C. Abbot, February 4th and 5th.

Flint, Genesee county, attended by Professors Geo. T. Fairchild, W. J. Beal and R. C. Carpenter, January 16 and 17.

Charlotte, Eaton county, attended by Professors W. J. Beal, Geo. T. Fairchild and R. F. Kedzie, January 13 and 14.

Howell, Livingston county, attended by Professors C. L. Ingersoll, A. J. Cook and R. G. Baird, Secretary of the State Board of Agriculture, January 20 and 21.

Centreville, St. Joseph county, attended by Professors A. J. Cook, C. L. Ingersoll, Pres. T. C. Abbott and Mr. Cassidy, the College Gardener.

Dowagiac, Cass county, attended by Prof. R. C. Kedzie, Secretary Baird and F. A. Gulley, foreman of the Horticultural Department.

The preference has been given to the above places, as no Institute has previously been held in these counties.

The first named member of each delegation will be the committee on behalf of the Faculty, to co-operate with the local committee in working up the details connected with the Institute, making out a programme, etc., except in the case of Dowagiac, where Hon. Milton J. Gard will act as such committee.

If for any reason it should be necessary to change places on any of the above assignments, such exchange may be made, provided it is done before the lists are published.

We recommend that the secretary attend all the above Institutes if he can do so.

We recommend that the Legislature be asked for an appropriation of three hundred dollars for each of the years 1879 and 1880, to defray the expenses connected with the Farmer's Institutes, for cuts or other illustrations of the subjects presented, etc.

All of which is respectfully submitted.

J. WEBSTER CHILDS,
MILTON J. GARD,
A. S. DYCKMAN,
} *Committee.*

On motion of Mr. Wells, seconded by Mr. Philips, the above report was accepted and adopted.

The Institutes were held as directed in the above report. Very few changes were made in the delegations actually attending. Prof. Carpenter was prevented from attending the Institute at Flint on account of sickness in his family. In addition to the appointed delegation for Flint, however, Secretary Baird was on the programme for a lecture.

The delegation to Charlotte included, besides the appointed members, Prof. C. L. Ingersoll. With these exceptions the delegations were precisely as above provided for.

The Institutes here reported constitute the fourth series that have been held under the general direction of the State Board of Agriculture. They do not differ in any marked degree from those previously reported, only as we become more accustomed to holding them, the necessities of particular localities and the wants of the farming community generally are better understood, from which cause, probably, full as much as any other, there is a perceptible growth in efficiency and interest.

That these meetings are duly appreciated by the farmers is manifest from the large numbers of the very best class of farmers that attend them. Sometimes they are attended by farmers from adjoining counties, who feel that they would not lose the benefit to be derived from an Institute for much more than what it costs them, in time and money, to attend it.

The Institute at Dowagiac was attended by a delegation from Van Buren county in the vicinity of Paw Paw, comprising some of the best farmers in our State, and whatever may have been the benefit these gentlemen received, they certainly added much to the interest and profit of the meeting. We say to them, come again, and to others, do likewise.

Our Institute work was not as fully reported in the State papers this year as last. The Detroit papers to some extent relied on their local correspondents, although Mr. J. P. Thompson attended several of these meetings as reporter for the Detroit *Post & Tribune*, and R. F. Johnstone, of the *Michigan Farmer*, attended several; the Bay City *Tribune* and the Saginaw *Courier* published very full proceedings of the Institute at Bay City.

CHARLOTTE INSTITUTE.

This Institute was held January 9th and 10th, in Sampson's Hall. This commodious hall was well filled at the hour appointed for opening the meeting, with an audience composed mostly of farmers and their wives.

Hon. Robert Nixon, of Oneida, who was President of the meeting, made the following opening address:

LADIES AND GENTLEMEN:—We have meet this evening to talk over the different topics mentioned in the programme. And by interchange of thought, we may reasonably expect to be benefited. Last fall when we met to talk over the propriety of having a Farmers' Institute in Charlotte the coming winter, the only hindrance appeared to be to get those wise men from the East to come over and assist us.

Gentlemen of the Agricultural College, we welcome you to Eaton county to assist us in our Institute. Ladies and gentlemen of Eaton County, who have come from your homes through the frost and cold, we welcome you to our Institute, to elevate and magnify your high calling.

We welcome you, citizens and friends of other counties, to this meeting, believing that you will feel at home with us and help us in our deliberations, giving us from your experience that which will be beneficial to us all.

The day is past and gone, we hope forever, in which it was thought that the man who tills the soil must of necessity know nothing but to plow, sow and reap, and be a hewer of wood and drawer of water. There is no reason why the son and daughter of the farmer of Michigan may not stand on the high plane of intellect with any other class of citizens. Michigan, our Michigan, in the early days of her legislation, made provisions for the education of her people. We have the Normal School, where young men and women are fitted to go and teach all over the State. We have the State University, an institution that we all feel proud of. Last but not least, the pioneer Agricultural College of all this broad land, where we send our young men to be taught the arts and sciences and receive a good liberal education, that will fit them for farming or any other avocation.

If we take into consideration the facilities the farmer has to-day as compared with what he had fifty years ago, we see that considerable advancement has been made, though perhaps not as much as in some other directions. Let us take a glance back for fifty years, when the sickle and the cradle cut our grain. When the horse, the ox and the flail were the instruments employed in threshing out the grain. Contrast them with the different machines of the present day for cutting, binding, and leaving good bundles all ready to stand in the shock. Compare the flail, the ox, or the horse with the threshing-machine of to-day,—behold the contrast. See, also, how we are favored in getting our produce to market, as compared with the time when many of us had to go 35 or 40 miles to dispose of our grain. Let us be encouraged, and let our motto be, whatever is worth doing at all is worth doing well.

Fellow-citizens of Eaton county, from this meeting we expect good results; it cannot be otherwise. The addresses and essays that are to come before us at this meeting must result in good. For in the interchange of thought, man with man, our ideas are awakened. What one does not know another perhaps

does. So by meeting together on this occasion, we shall get some new ideas that may be beneficial to us in aiding us in our work.

The great danger is in starving the land. There is but one safeguard; that is, add as much to as you take from it; though our soil is rich and productive, by over taxing the land you will impoverish it, growing wheat year after year, or oats without manuring,—no farmer, however careful he may be, can make manure enough to go over many acres. But if we seed our wheat ground and oats to clover every spring, we get remunerated the next fall in pasture; and whether the roots of the clover or the top does the most good, I am not prepared to say; but one thing I do know, seeding to clover enriches the soil.

There is nothing more befitting than that the farmers should meet together to deliberate on the best mode of conducting their interests. The doctors, the lawyers, the railroad managers, millers and others, meet in associations from time to time to execute plans for their best interests.

In conclusion I would say, that we as citizens of this peninsular State, have everything that we can desire to make us a prosperous people. We have a good soil for all kinds of crops suited to this latitude. We have the pine forests to supply us with lumber, the mines of the Upper Peninsula with iron and copper, and water navigation on the west, north and east. With all those advantages, if we do right with our fellow men and our God, we shall be a happy people.

Prof. Geo. T. Fairchild gave a lecture on "Art and the Sciences in Education." See lectures and addresses given at more than one Institute.

Mr. Esek Pray read the following essay on "Apple Orchards—the Best Varieties—their Cultivation and Pruning."

THE APPLE ORCHARD.

I think that the apple orchard should be considered as one of the most important departments of husbandry. There is no branch that adds more to the health and happiness of our families, and, I am inclined to think, the profits of farming, than a first class orchard.

Location.

The most favorable location for an apple orchard, I think, is on what we call our best elevated wheat soil. Too much pains can not be taken in the thorough preparation of the soil, underdraining it, if necessary. Having selected your trees, plant them not nearer than thirty feet apart. I consider a thorough cultivation of the soil for at least ten years after planting a necessity, for the complete success of a young orchard; and I would not entertain the idea of planting, without mulching thoroughly after setting, not allowing anything to be crowded against the stock of the tree. I have no doubt but a tree map be crowded in its growth, as we may crowd a calf or a colt, but what we want is a healthy growth, as in other departments of farming; and we may as reasonably expect a premium calf from one turned at an early age to shift for itself, as to expect a thrifty, healthy growth from trees set and cared for as many of our orchards are. Like any other department in husbandry, it needs constant attention. There seems to be a disposition with some of us to plant large orchards. If a person can and will give it the necessary time and attention, right; if not, a small orchard is much better in every way.

I have often had it suggested to me that I must have a large orchard; when

in fact I have about four acres, and have gathered over three hundred bushels from a little less than one half acre. I think that for orchards of large growth, that manuring and pasturing with hogs and sheep may be substituted for cultivation to quite an extent, successfully.

Pruning.

I can see no reason why a person with his mind established as to what he wishes in regard to style in an orchard may not succeed.

In regard to heading, I prefer a medium height. If started too low they interfere with cultivation and the general appearance is not pleasing. If too high, they are more liable to lean to the east or northeast, and by thus exposing, the stem or stock soon become affected; borers intrude, and the result is a failure for the tree, and also adding to the labor of pruning and gathering the fruit. There is a liability to leave too many main branches in starting a head. We are impressed with the idea that there is plenty of room, but afterward find it necessary to remove large limbs, which should be avoided, if possible. It seems quite essential that pruning should be attended to each year, removing surplus twigs and by such attention avoiding the necessity of removing large limbs and cutting away too much at any one time. I have usually pruned from March to June, and in addition, attention should be given every few days to pinching off shoots, clipping back straggling branches, with a vigilant eye for insects.

Varieties.

I suppose that the most of us have in view, first, the health and comfort of our families, and therefore, in the selection of varieties, we should take into consideration those best adapted for the family. I will name a few that I consider good: Yellow Harvest, Red Astracan, Sweet and Tart Bough, Lowell, Maiden Blush, Twenty Ounce, Fameuse or Snow, Greening, Tallman Sweet, and for late keeping, Baldwin, Northern Spy, Roxbury Russet, Golden Russet, Red Canada.

For market profit we need but few varieties, and they should be of the very best in regard to hardiness, growth, bearing and keeping qualities. I think we should take more interest in preparing suitable fruit cellars for the purpose of keeping apples through winter. In Eaton county our common cellars under our dwellings, arranged for the protection of vegetables, are rarely what they should be. My main profit from the sale of apples has been from my best keeping varieties. Two years ago the coming March, I sold apples in Chicago at $1.60 per barrel by the car load; in April I sold for $1.90 by the car load. In May I sold for $4.75, realizing $4.75, less the commission for selling, with less waste from the last shipment in taking from the cellar than the first. I find that it costs me no more to raise and handle a bushel of apples of a variety that will average me in market one year, with another $1.00 per bushel, than one of the standard varieties equally as desirable except in the keeping quality, that will average forty cents. If there is a net profit of fifteen cents on a bushel of apples at forty cents, we can readily see there is five times the profit, at least, on a bushel at $1.00, and there would usually be quite a per cent. to add in handling. In one variety you would receive $1.00 for 2½ bushels, in the other case, one for a bushel. We can not reasonably expect to succeed in keeping fruit, unless we exercise great care in gathering and handling. It will not do to neglect the gathering; very many leave them too long on the tree. My experience is that with some varieties, if left on the tree ten days in autumn after they should be

gathered, especially if the weather be mild, will shorten the season thirty days, or they will come to maturity that much sooner than they would if gathered earlier.

I never handle after storing until the season for marketing. My best keepers, gathered the last of September and first of October, I don't expect to see again until next May. They are stored in bins. The varieties that bring me the best returns are the Red Canada and Roxbury Russet.

DISCUSSION.

J. P. Thompson, of Detroit. What do you consider the best method of cultivating a young orchard?

Mr. Pray. By hoed crops; principally, the corn crop.

Mr. Thompson. How do you keep your apples in cold weather?

Mr. Pray. A little frost will not injure apples in the bin. I do not ventilate my cellar during the warm days that immediately follow a severely cold spell. I ventilate on a frosty day. A cellar for keeping apples should be dry and cool.

Secretary Baird. You say that apples will keep much better if harvested at the proper time. What do you regard as the proper time, and how is it distinguished?

Mr. Pray. I harvest my apples when I notice the twigs become tender. This is indicated by the dropping of the fruit.

Prof. Ingersoll. In storing apples, do you place them near the bottom or top of the cellar?

Mr. Pray. I keep them in bins or shelves, extending from about six inches above the bottom of the cellar to as near the top as is convenient for storing.

Some discussion followed in regard to pruning, participated in by Prof. Beal and others, in which the practice of cutting off large branches was condemned, and all seemed to be agreed that if only small ones were cut off it did not matter at what season of the year the pruning was done.

FORENOON SESSION.

Friday, 9 o'clock A. M.

Mr. Robert F. Kedzie, Assistant in Chemistry at the Agricultural College, read the following paper on

"ANALYSIS OF MILK FROM DIFFERENT BREEDS OF COWS."

For thousands of years the milk of the cow has been an important part of human food. Even in the earliest writings flocks and herds are mentioned, and we may safely infer that cows' milk in some form, either as milk, cream, butter or cheese, has always constituted an important part of the food of mankind.

And milk is entitled to a high rank as food. It is one of the very few substances that contains all the elements, and in the right proportion to support life. A person cannot live and be in good health upon lean meat alone, or potatoes alone for any length of time, because in the first there is not enough carbon, and in the second not enough nitrogen. But in milk we find all these elements present in just the right proportion for human food, and so it is called the perfect food, the type of them all.

We are apt to think that milk is not a very valuable food because it contains

so much water; but in spite of the water it ranks well with other foods in nutritive value. A pound of milk is equal in food value to a pound of oatmeal or rice, or whitefish; while a pound of milk is worth four times as much as a pound of potatoes or green vegetables, and a little more than bakers' bread. One writer states as a result of his analysis of cows' milk, that when meat free from bone is worth 25 cents per pound, fresh milk is worth 14 cents per pound.

Milk is a white, sometimes a bluish or yellowish white liquid, a little heavier than water. It may be defined as a solution of sugar and casein in water, in which little globules of fat are floating. Milk also contains mineral matters, such as a small amount of phosphate of lime, common salt and chloride of potassium. These mineral matters are of some importance, as they go to make up bone, the framework of the human body. But the most important substances in milk are casein and fat, the first forming the basis of cheese and the second of butter. The greater the amount of these present the more valuable will it be both for food and for dairy purposes.

The following is the average composition of cows' milk:

Sugar	4.54	per cent.
Casein and albumen	4.37	"
Fat	3.80	"
Salts	.64	"
Water	86.65	"
	100.00	

That is, in every hundred pounds of milk there are about $86\frac{2}{3}$ pounds of water, $4\frac{1}{2}$ pounds of sugar, $4\frac{1}{3}$ pounds of albumen and casein, 3 4-5 pounds of fat, etc. Now for the sake of comparison, let us see what milk from which the cream has been removed, "skim milk," is made up of:

Water	89.53	per cent.
Butter (fat)	.78	"
Casein	2.95	"
Milk sugar	5.89	"
Ash	.85	"
	100.00	

By comparing skim-milk with new milk it appears that most of the fat is removed as cream, but not all. A little remains in the milk, and this, so far as making butter is concerned, is an entire loss.

It will be noticed that skim-milk contains a little less casein than new milk. That is because some casein is removed with the fat. It is supposed that each globule of fat is surrounded by a thin shell of casein. Cream varies a good deal in composition, but it is generally made up of about two-thirds water, one-quarter fat, together with some sugar, etc. The usual rule I believe is that a quart of cream will make from 14 to 15 ounces of butter, but very rich cream will make even more than this.

Allow me to digress here to say, that in order to get the most cream from milk, it is very important that it be kept at the right temperature. To test this question, I took about twelve quarts of milk, and after saving out a little for analysis, put the rest into three ordinary sized milk pans, filling the pans to exactly the same depth of two inches in each case. I then kept one pan at the temperature of 32° F., another from 55° F. to 60° F., and the last from 75° F. to 80° F., allowed them to stand for exactly twenty-four hours, and

then carefully removed the cream from each pan. I then determined the amount of fat in the new milk and in the skimmed milks. The following table shows the result:

CONDITION OF MILK.	Kept 24 Hours at Temperature of	Fat,—Per Cent.
New milk	....	3.26
Skim-milk of same	32°	1.25
Skim-milk of same	55° to 60°	.59
Skim-milk of same	75° to 80°	.79

More cream fails to come to the surface in milk kept at 32° than at higher temperatures. This seems strange, but I tested this matter repeatedly, always with like result. As I consider cream that remains in milk as so much loss, it seems to me that persons engaged in butter-making cannot take too great pains to keep milk at the temperature most favorable for cream to rise. The loss from a few quarts of milk would not be very great, but when a person is engaged in dairying upon a large scale, he might find himself at the close of the season, decidedly out of pocket in consequence of such neglect.

Another point closely connected with temperature, is the depth at which milk set for cream should stand. I tried some experiments by placing milk in graduated tubes. In the first tube I placed milk two inches deep; in the second, four inches; in the third, six inches; and in the fourth, eight inches. After allowing them to stand twenty-four hours, I read the amount of cream in each tube, and found the percentage to be about the same in each. After removing the cream from each specimen, I determined the amount of fat (cream) remaining in the milks, and found that they all contained about the same amount. I infer then, that within certain limits the depth of milks set for cream is not important.

Conditions that Modify the Character of Milk.

The length of time elapsed after calving has a decided influence upon milk. The first milk is very rich in cheesy matter; but after a few days this excess disappears. The general rule is that the greater the length of time after calving, the less is the amount of milk given, but the amount of water in the milk of a cow that has been in milk for some time is very much less than that of a new milch cow; so that for practical purposes it may be just as valuable even if the amount given is less.

The age of cows is said to have a very decided influence upon the quantity and quality of milk, and a cow is not considered to be in her prime until she has been milked several years. Milk of young cows is considered poorer in quality, and smaller in amount than that of older cows.

The character of the season is said to influence greatly the quality of milk. Cows give a greater quantity of milk during wet seasons when grass is succulent. But the milk in said to contain much more water than in dryer seasons, so that the milk for a wet season does not furnish any more butter or cheese, even if the milk is greater in amount.

The question of what influence the *kind of food* has upon milk, is one of great practical interest to the farmer. For instance, after a cow has been fed for some time upon dry hay, is it not possible by the addition of oil-cake or ground feed or other rich materials to the food, to make the milk richer in

butter or cheesy matter? This subject has been thoroughly investigated in Germany, and German chemists have come to the conclusion that they can increase the quantity of milk by high feeding, but cannot improve the quality. Let us not misunderstand this point. A cow fed with nutritious food gives, we will say, milk containing a certain amount of fat and casein. Now if we give this cow very much richer food, we shall probably get a much greater quantity of milk, but it will not be richer than before; a quart of it will contain about the same quantity of fat and of casein.

We cannot make a *butter cow* or a *cheese cow* at pleasure by simple variation of food. These are peculiarities of individuals and of breeds.

The result of investigations made in Germany in regard to the influence of variations in the kind of food on the quality of the milk, are well shown in the following table:

COWS WHEN FED ON	Hay.	Hay and Albuminoids.	Hay and Starch.	Hay and Oil.	Hay.
Gave pounds of milk	16.15	15.90	14.68	15.47	13.02
Containing per cent. of solids	13.25	13.18	13.33	12.88	13.24
Fat in 100 lbs. of milk (containing 12 per cent total solids),	4.18	3.95	3.88	3.85	3.09
Albuminoids in 100 lbs. milk	2.74	2.92	2.88	2.80	2.86

Prof. Ingersoll and myself tried one experiment to determine the influence of food upon milk. We took two cows, "Fanny 2" (grade Ayrshire), and "Irene 2" (grade Alderney). The cows were fed 5 pounds of cut corn stalks, 2 pounds of cut oat straw, and 2 quarts of a mixture of two parts Indian corn meal and one part shorts, twice a day. This was poor feed. After they had eaten it for five days, I took samples of milk from each cow and analyzed them. The cows were then put upon high feed, viz.: the same amount of cut feed as before, and 40 pounds of sliced turnips, with 6 quarts of the mixed feed. After five days' feeding I took samples of the milk, which I analyzed. The results appear in the following table:

COW.		Cream, Per Cent.	Milk. Pounds.	Casein, Per Cent.	Sugar, Per Cent.	Fat, Per Cent.	Ash, Per Cent.	Water, Per Cent.
Poor Feed	"Fanny 2d"	16	7	5.12	4.05	4.27	.73	85.83
	"Irene 2d"	13⅓	15	5.21	4.20	4.59	.80	85.20
Rich Feed	"Fanny 2d"	14	12½	5.68	3.83	3.72	.61	86.16
	"Irene 2d"	16	16	4.96	4.20	4.25	.70	85.89

It must not be inferred from these experiments that the quality of food has *no* influence upon the amount of milk given or its richness, because it is not

true. I am not attempting to defend the practice of persons who allow their cows to weather the storms of winter and draw their rations from the straw-stack. A half-starved cow will give half-starved milk,—milk in which cream is conspicuous from its absence, and water for its abundance. Dairymen know very well that to get good milk in the pail they must put an abundance of good food into the mouth. But these experiments do show that we can by feeding increase the richness of milk up to a certain point and no further. If a large amount of rich food is given, a part of it goes to increase the number of quarts of milk, and the rest to the increase of fat in the animal. So that it is doubtful whether it will pay to feed milch cows very freely of extra rich food, such as corn meal, bean meal, oil-cake, etc., in addition to plenty of nutritious food.

The last cause affecting the quality of milk to which I invite your attention, is the *kind of breed.* Let us look at the composition of milk of different breeds of cattle.

About a year ago, a series of experiments was undertaken at the College, to determine the relative value of the various breeds of cattle for dairy purposes. I analyzed the milks of cows on the College farm, and "Natives" of farmers living near. By "Natives" are meant those in which no distinct breed is apparent. Samples of milk were taken two weeks from time of saving first milk, as nearly as was possible. The following are the average results:

NAME OF BREED.	Cream, Per Cent.	Milk, Pounds.	Sugar, Per Cent.	Casein, Per Cent.	Ash, Per Cent.	Fat, Per Cent.	Water, Per Cent.
Shorthorn	12¾	17¾	4.03	4.81	.70	2.67	87.79
Ayrshire	13⅔	19	3.75	5.74	.70	3.70	86,11
Jersey	19½	16	4.20	4.96	.70	4.25	85.88
Galloway	10	6½	3.80	5.36	.67	2.74	87.43
Native	8¼	13½	3.69	5.57	.64	3.10	86.99

This table is of especial value because the cows were kept upon much the same kind of food, and the milk was analyzed after they had been in milk the same length of time. But the number of analysis was somewhat limited, and the milk of some breeds I could not get. I have compiled, from every source at my command, analyses of milk, and taken the average of each breed. The cows were not all under the same conditions, such as food and climate, and therefore their milk cannot be compared with as much certainty as if they had been under the same conditions. But if the milk of any breed is inclined to be especially rich, it should be apparent in spite of these variations.

The following gives the result of analyses of the milk of various breeds of cows:

NAME OF BREED.	Sugar, Per Cent.	Casein, Per Cent.	Fat, Per Cent.	Water, Per Cent.	Ash, Per Cent.
Short-Horn	3.76	4.41	5.10	86.04	.68
Ayrshire	3.90	5.08	3.75	86.57	.70
Jersey	3.76	4.37	6.87	84.28	.71
Holstein	4.35	4.21	6.84	83.97	.61
Galloway	3.80	5.36	3.40	87.43	.67
Devon	4.23	5.29	3.96	85.71	.81
Grade	4.29	4.99	4.01	85.92	.79
Native	4.08	5.21	3.36	86.64	.71

According to the amount of fat in the milk of these breeds, the Holstein, Jersey and Shorthorn would rank among the first for butter making, and the Ayrshire, Native, Galloway and Devon for cheese making; provided we may be allowed to call "Natives" a breed. But it certainly would be very unjust to say that one breed of cattle is a better butter breed or cheese breed than another until all the facts entering into the problem are taken into account.

How does the milk of Native cows compare with that of of pure blooded cows? From my analysis I infer that the milk of natives is equally as rich and large in amount as that of some of the breeds, such as Shorthorn, Devon and Galloway, but not so rich as the Jersey or Holstein. Prof. Voelker, of England, made some experiments to determine how the milk of pure Short-Horns would compare with that of common cows in richness and amount, both kinds being kept upon the same kind of food. He found upon the average that pure bloods gave 49 pints, and the common cows 52 pints daily, a difference of three pints in favor of common cows. He then analyzed the milk of each, with results as follows:

	Common Cows.	Pure Bloods.
Water	86.65 %	87.29 %
Butter	3.99 "	3.86 "
Casein	3.47 "	3.28 "
Milk Sugar	5.11 "	4.89 "
Mineral Matter	.78 "	.77 "
	100.00	100.00

In this case there was little difference, the slight variation being rather in favor of common cows. But if this experiment had been tried with other breeds more celebrated for richness of milk the result might have been far different. The truth probably is that some natives are as good milkers as pure bloods, but there is not that uniformity that exists among pure blooded cattle.

Can not our common native cows be greatly improved in their butter producing qualities. The reason why the Jerseys stand first in the rank of butter cows is that in the Island of Jersey butter is a very important article of commerce, and the cows that give the richest milk have been selected for breeding purposes, and in this way the breed, as a whole, has been brought up to a high standard of excellence. In the same way, by carefully selecting the "good milkers," and breeding from them, the milking qualities of even our common stock can be greatly improved. This is certainly a promising field, and especially valuable because no great outlay of money is required.

The question is often asked, which is the best breed for butter? The practical man must answer that question,—the chemist cannot. All that he can do is to tell whether one kind of milk is richer than another; but the practical dairyman, by knowing the quantity of milk and butter, and how much a pound of butter costs in food and labor, can decide this question beyond dispute.

I can find but very few statistics bearing upon this point. Mr. L. S. Hardin has collected some facts on the subject, from dairymen who keep the different breeds. From his interesting article in Rural New Yorker, of Dec. 7, 1878, I take the following table, showing the average number of pounds of milk per annum, and the average number of pounds of butter from each breed:

NAME OF BREED.	No. of cows in herd.	Av. No. lbs. of milk per animal.	Av. lbs, milk to 1 lb. butter.	Av. No. lbs. butter per cow per annum.
Shorthorn	28			252½
Ayrshire	11	5,469	25	273
Jersey	14	5,625	20	281
Holstein	12	8,767	25	350
Native	17			302

According to this statement, the following is the order of these breeds for butter-making: Holstein, Native, Jersey, Ayrshire, Shorthorn. But we can not say that Holstein is a more valuable breed for butter than any of the others. We must know how much it costs to make a pound of butter from the different breeds,—how much the food and labor costs,—before we can draw any conclusions. These elements are lacking in all published reports, so far as I know, and the absence of these makes all statements as to the amount of butter produced by a breed, comparatively worthless.

It seems a little strange that the ordinary "natives" should prove to be as valuable for dairy purposes as some of the most famous breeds. The despised natives have some points in their favor after all. Their first cost is comparatively small, they are hardy, do not require high feeding to keep them in good condition, and they will give as much and as rich milk for the food consumed as many of the fancy breeds. In fact, many persons who pursue dairying for profit and not for pleasure only, think a well selected herd of native cows is the most profitable after all.

Most persons, in selecting a breed, would choose one in which the cows are large and will give the greatest amount of milk, without any reference to what the product costs. Other things being equal, a large cow is better for the dairy than a small one, just as a large engine has greater capacity for performing work than a small one. But the test in the dairy must be, which breed will give the greatest amount of butter or cheese for the same amount of food consumed? Prof. Arnold, in a recent number of the *N. Y. Tribune*, puts this matter in a very clear light. He compares two cows, one weighing 1200 pounds and the other weighing 800 pounds, both giving the same amount of milk, of equal richness. He says: "It is a common rule and pretty near the truth, in estimating the cost of keeping animals, to reckon one pound of hay a day for each fifty pounds of live weight, as the amount necessary to sustain the animal in a uniform condition, without gaining or losing. If we adopt this rule, without taking into account the better use of food by larger animals or the extra food required for producing milk, which will be the same for both cows, it will cost for the simple support of the large cow, 24 pounds of hay a day; for the smaller one, 16 pounds; difference, 8 pounds a day. For a year this will be 2,920 pounds, and for ten years—the average period of usefulness of dairy cows—it will be 29,200 pounds, or 14.6 tons, which is the cost of maintaining for ten years 400 pounds of live weight, not required for producing milk, and which is worth no more at the end of the term than at the beginning. If we count the hay at $7 a ton, the cost of sustaining 400 pounds of extra weight ten years will be $102.20, or $10.22 a year. It will not take long, at this rate, for extra weight to eat up its value and bring itself into debt, simply to keep itself alive."

Prof. Arnold compares the herd of Mr. Boies, whose cows average 1,200 pounds in weight, with Mr. Blodgett's herd of Jerseys, which average 780

pounds. Mr. Boies, with his large animals, gets an average of 314½ pounds of butter, while Mr. Blodgett, with his small animals, obtains an average of 234½ pounds of butter. "Judged by the usual standard of product per cow, this dairy would by most dairymen be at once set down as the least desirable and the least profitable. But in fact the reverse is true. Mr. Blodgett's dairy is the most profitable, for he gets the most butter in proportion to the food consumed."—Prof. Arnold.

One additional reason why Mr. Blodgett's herd of Jerseys is the most profitable, seems to have been overlooked. The Jerseys give a milk much richer in butter than most other breeds, but not so large in amount; and the cost of labor required to handle the extra amount of milk to make the same amount of butter, is saved. If one cow will make a pound of butter by giving 25 pounds of milk, and another a pound by giving 20 pounds of milk, the second cow may be more profitable, even if she gives a few pounds of butter less in a year, because the labor of milking and handling the extra milk is saved. The average size of cows is of importance as Prof. Arnold shows, and the *size of the milk pail* required for a given result is also important.

I have thus briefly called your attention to the character of the milk of different breeds of cattle. Which is the best breed for butter or cheese, is a question I have not attempted to answer. I have only indicated the way in which it seems to me this question must be decided, if at all. At present, it is all but impossible to get at the relative value of the different dairy breeds. When dairymen desire to indulge in a little advertising of their favorite breeds, they do not publish statements showing the *average* number of pounds of butter made from each cow during the season. They select some favorite cow, celebrated for giving a large amount of rich milk, and rush into print with statement of milk and butter produced, and exultingly ask "who can beat it?" and unless some one can "go one better," the game of bluff carries the day. One cannot estimate the worth of any breed for general or for special dairy purposes from the startling results obtained from exceptional animals. As well try to determine the average diet of men from the enormous amount some glutton may swallow. In determining the value of any breed for milk, *we want the average* and not the *unusual*. If the yield of a cow is very unusual it is worthless for this purpose.

Again, when yields of herds are given we get only half the facts in the case. If one dairyman gets on the average 250 pounds of butter from his cows, and another 300 pounds, the first is apt to say, "I am not going to own up that I am beaten," so the whole truth is never known, and wonderful yields are all the public ever hear of. On this subject of the value of breeds for milk, the ordinary is more valuable than the extraordinary. We want sober facts and not surprises. When dairymen will be content to give us the plain prosaic facts which have nothing wonderful about them except their truth, we may arrive at some estimate of the comparative value of the different breeds for the production of butter or of cheese.

DISCUSSION.

Mr. Strange.—I would like to know whether, in any of Mr. Kedzie's experiments, the milk was allowed to stand longer than twenty-four hours. It seems to me that at a low temperature a longer time would be required for the cream to rise perfectly.

Mr. Kedzie.—I had some duplicate specimens that stood from two to three days, but the quantity of cream was not appreciably increased.

Mr. Dansforth.—What do you regard as the proper temperature for the rising of cream?

Mr. Kedzie.—Fifty degrees.

Mrs. James Murray read a short essay on "Farm Life," which was an earnest plea for the young to be kept upon the farm. She said our youth needed that kind of education which would make them love farm life, and that much could be done in this direction by making home attractive.

Following the reading of this paper, Mr. Thompson said this question of keeping boys upon the farm was one of great importance. The cities are crowded and many are unable to find employment. At the newspaper offices communications are constantly coming in from young people in the country, asking what they can get to do in the city. He thought parents were often to blame for this state of things. Not unfrequently they were in too great a hurry to sell their farm and move into the village or city. Keep the farm—keep a home for the children in the country, and make it such that they can love it.

Prof. Fairchild thought that the youth of the country would not be so desirous to leave the farm if the operations upon it were so conducted as to make them more of an education and give more scope for thought.

Prof. Ingersoll said the farmer's home was frequently too void of proper means of entertainment for the young. The desire to make money, to provide for the future, made many a home unattractive.

The following essay was read by Mr. E. F. Preston, of Sunfield, on

DAIRYING FOR PROFIT.

The late Mr. Greeley published a book some years ago, entitled "What I know About Farming." Without presuming to rival Mr. Greeley in farm literature, and confessing my inability to please you with a scientific disquisition upon the bovine race and their products, I shall endeavor to confine myself to "what I know about dairying," for profit, in Eaton county.

That Eaton county is well adapted to dairy purposes is proven by the fact that in order to grow good crops of cereals, the farmer is forced into an unceasing war against the encroachments of June grass and white clover. I believe that the time is soon coming when these grasses will be cultivated, instead of expending the whole physical force of the county in a vain endeavor to exterminate them. Nature, and the experience of men upon heavy clay sub-soils in other portions of the country, will sooner or later teach us something here in Eaton county.

Farmers of course have the right to groan over the heavy taxes imposed to pay railroad bonds, and the generally low prices of farm products! For instance: Our Eaton county butter has been sold the past season at prices ranging from 6 to 14 cents per pound, and averaging less than 10 cents.

Now there is a little matter connected with the low price we have received for our dairy products that is not very pleasing. By carefully studying the reports of the great butter markets of the country, we learn that other farmers, in other localities, who make dairying a business, received the past season an average price for their butter that nearly or quite doubled ours.

The question presented is one of comparative loss and gain; and the fact that we are on the losing side in this comparison makes it somewhat distasteful. No one will doubt for a moment that if, on the favored side of this comparison, they have received double the price that we have received for our products, they have obtained not less than $15 per cow *more* than we have realized. Now I

have questioned members of our board of supervisors, and they inform me that there are at least 9,000 cows in our county that, by the comparison made, and which is essentially true, have been milked at a loss of full $15 per cow, giving a total of $135,000 that Eaton county has lost the past season, by putting a low grade of dairy products upon the market.

Still, in the face of this spend-thrift, ruinous policy,—a policy that, for the year 1878, cost us not less than $135,000, we groan about taxes, hard times and bad management upon the part of our public officers!

This careless, spendthrift policy *means* something; $135,000, which was within our reach and which we did not secure, and which amount has been lost year after year in the past, *means* something! Bankruptcy and a change of the ownership of the soil is the end foreshadowed, and if we are anxious to avoid the catastrophe, we will look earnestly, not only as individuals but as a people, for a reliable remedy, and then apply it with vigor.

I have heard it remarked by butter buyers in different places, not only in but out of our county, that Michigan farm ladies do not know how to make good butter (hence only 10 cents for Michigan butter), while the ladies of other localities bring into the family bank from 20 to 25 cents per pound. Now, I propose to defend our ladies against the imputation that they are the cause of the loss, to the farmers of Eaton county alone, of not less than $135,000 per annum.

I will state, however, in advance, that I shall present an array of facts that will hit my fellow lords of the soil, and in their efforts to cover up *their* guilt, it may be possible that some will undertake to tell their too confiding ladies that it was all owing to a combination of rascally merchants who are arrayed against the poor farmers, in an effort to ruin them by taking from Eaton county dairy products alone, $135,000 per annum.

To commence my defense then, I shall attack the farmers of Eaton county first, by telling them that not more than one-half of the cows milked in Eaton county are physically fit for dairy purposes.

We all know that it is an easy matter to raise a cow from a calf. It is just as easy to purchase cows if we have the money; and since no one ever heard of a dishonest farmer,—or a farmer that had a poor cow to sell, it follows of course, that it is no very difficult matter to purchase good cows. But this is a wrong conclusion. It is a difficult matter to select calves that will grow into good cows; and it is generally equally difficult to select good milkers when purchasing cows, unless we have taken some pains to instruct ourselves in the art of detecting readily, the good and bad qualities of the animals we purchase or raise.

I will state in as few words as possible, what I know of the marks that indicate good milkers. I learned them from Prof. Arnold, T. D. Curtis and others of known celebrity as writers upon dairy topics, and I repeat them, because I have learned by observation that they are worth something to every farmer in Michigan who is not already acquainted with them.

In the first place, a general feminine appearance is necessary, which is as easily discovered in a cow, or calf, as coarse muscular power in the ox. Persons who are unable to draw a correct line between the coarse masculine, and the well developed feminine appearance of a cow, had better hire their neighbor to make their selections for them.

No one will dispute the fact that a large flow of milk requires an animal capable of consuming a large amount of food; it follows that in order to digest a large amount of food, a cow must possess large healthy digestive organs.

Now, the outward marks of large digestive organs are, depth and breadth of abdomen, and broad, square hips, giving a wedge-like appearance to the cow from hip to shoulder. Broad hips are also an indication of a good development of blood vessels in the milk-producing region, and sufficient udder in which to store milk from one milking to another. A little observation will teach almost any farmer, that a straight slim-bodied cow, with narrow compressed hips, is almost sure to disappoint the milk pail.

The escutcheon, or milk-mirror, though of modern date, is one of the most valuable marks (when taken in conjunction with the marks already given) by which we may make good selections of dairy stock. To those not already acquainted with this mark, let me say: Stand behind the cow, and look at the hair on the hind quarters of the udder. If the hair grows downwards, straight and smooth there is no development of escutcheon. But if the hair turns outward and upward, extending out on to the thigh, there is a good development of escutcheon, on the hind quarters of the udder. The front quarters are furnished with separate escutcheons, which blend together in the middle. These, with large milk veins, are good indications of a large flow of milk.

Without any explanation of this peculiar growth of hair, always found upon the udder of first-class milkers, the first impression is that it is a first-class whim. But science has come to the relief of the observing farmer, and demonstrated by numerous dissections, that this peculiar growth of hair is absolutely an outward measurement of the size and quantity of blood-vessels, that supply the material from which milk is manufactured by the lacteal veins of the udder.

Calves destined to make good milkers, have this escutcheon or mirror plainly developed when viewed from behind, and when accompanied by broad hips and depth and breadth of abdomen, my advice is, do not sell such calves for anything less than two prices; for the chances are, they will make good milkers, no matter how "native" or "blooded" the stock may be.

Thick heavy lips, indicating a good constitution, large open nostrils, indicating good lung-power, are marks that should not be overlooked.

It often occurs that cows will have broad hips and powerful digestive organs, with no development of escutcheon. Such animals are poor milkers, but good beef producers, of which the "Short-horns" that we generally see at our State fairs, are perhaps the best types.

It often occurs too, that a well developed escutcheon is found on cows with narrow hips and weak digestive organs. Such animals are free milkers for a while, but soon lose flesh and, to use a farm expression, "dry up." This is accounted for from the fact that the digestive organs are called upon to perform labor which they are physically incapable of performing. In other words the cow, in order to sustain animal life, is forced to quit the business of manufacturing milk.

The quality as well as quantity of *water* furnished cows, has full as much influence upon the quality of butter or cheese manufactured as the quality of food. Cows that are forced to drink swamp water or the filth from stagnant pools or cat-holes, will invariably give milk that is poisoned in just the proportion that the water furnished them is impure. No man who neglects the quality of food and water furnished his cows, has any right to expect a good quality or a paying quantity of butter or cheese.

Taints in Milk.

Since the establishment of butter and cheese factories in this country the susceptibility of milk to taints drawn from rank food and stagnant, miasmatic water consumed by dairy stock, has been receiving increased attention. We often hear this taint or animal odor confounded with animal heat. Now we know that animal heat is necessary to animal existence. A little reflection will teach almost any one that an offensive odor in milk is not necessary to its secretion nor to the existence of animal life. Hence animal heat and animal odor are not at all synonymous. Again, this odor, or taint is increased by bad food, water, air and general mismanagement, and often becomes unendurable to persons of sensitive olfactory nerves. On the other hand, taint is decreased in just the proportion that cows are furnished good food, pure water and pure air.

But at all times of the year there is an offensive odor exhaled from fresh drawn milk, which when carried along into the product manufactured damages its taste and keeping qualities, and, necessarily, its value. We will suppose a case in which milk fresh drawn exhales an offensive odor. The usual process is to strain it into pans and set for cream. The milk cools gradually and the cream rises and forms an air-tight covering for the milk and its tainting odors. Until the milk, cooling from 98°, or blood-heat, to 70°, reaches the latter point, the whole tendency of the taint is evaporative, and rising, impregnates the cream with its unwholesome taste and smell. Finally the cream is taken off, taint and all, and churned. The lady of the house, after all her care and labor, is repaid with a batch of butter that is unfit to eat. Now I venture the assertion that the great bulk of butter manufactured in Eaton county is made from milk more or less tainted, and handled in the manner described. And this is the reason, the primary cause of our butter bringing but a shilling when the best butter makers in other localities are receiving from 22 to 28 cents.

This animal odor, this taint—what does it consist of, or what is it? Prof. Arnold and others who have given a great deal of time to the work of giving a practical answer to this question, inform us that it consists of an oil that is very volatile in its nature. In other words, there is a volatile oil in milk that takes on all the offensive odors of the food, water or air furnished the cow.

But what can we do to neutralize the effects of this tainting, volatile oil? Prof. Arnold says that in order to obtain even fair results, the milk should be thoroughly aired and cooled as soon as possible after it is drawn from the cow. T. D. Curtis, of New York, a practical dairyman and writer upon dairy topics, says that *air* is the only purifier of milk, and that airing is of full as much importance as cooling—and that *this* is the great question presented to the butter and cheese makers of the United States.

It is true that cooling milk to 70° or less as soon as possible after it is drawn neutralizes the tainting element to a great degree, and is an improvement upon the practice of setting for cream while warm from the cow and depending upon the atmosphere for a cooling power. Very many dairymen strain their milk into tin vessels surrounded with cold well water, and dip and pour it until it is cooled to the right temperature, before setting for cream. These men obtain the highest prices for their products, and have no trouble in securing ready sales.

There is another process recommended by Prof. Arnold, which is beyond the reach of the ordinary butter-makers of Michigan. He says that this oil, or taint is somewhat volatile at 65° of heat, and that by heating the milk to 150° as soon as possible after it is drawn, causes this volatile oil to go off with a rush.

In butter making the milk has to be cooled again to 70° or less, stirring constantly through the whole process, in order to assist evaporation and secure a uniform heating and cooling of the whole mass. When cooled to the desired temperature, it is set for cream. It is by this process that the best creamery butter, that commands the highest price, is made.

In cheese making by this process of heating, the milk is cooled down to 100°, the rennett applied, and the curd worked in the usual manner.

To test this heating process, two years ago, I asked my patrons, whose cows were eating leeks in the spring of the year, to send their milk to the factory for one day. They did so, and I first heated it up to 160°. Then I cooled it to 84°, and applied the rennett. After cutting the curd, I heated it again to 100°, and let it cool at that point. I was disappointed in the result. Contrary to my expectations, I produced a very good cheese from milk badly tainted with leeks.

In conclusion, I repeat that good cows, well fed, watered and cared for, are the first essentials to profitable dairying. Thoroughly airing and cooling milk as soon as possible after it is drawn is a necessity that cannot be overlooked. A cool milk room, away from the odors of the kitchen or cellar, in butter making is another necessity. Perfect cleanliness in the milking yard or stables is still another necessity. Of course the ladies are always neat. It is in this manner, which I have imperfectly described, that dairying can be made a paying branch of our diversified modes of extracting money from the soil of our farms, and the $100,000 now lost by putting an inferior article of butter and cheese on the market, saved to the farmers of Eaton county alone.

DISCUSSION.

Prof. Beal.—How many of your neighbors believe it is injurious to the milk to have the cows drink stagnant water?

Mr. Preston.—Very few of them; yet much of the tainted milk that comes to the factory, is caused by bad water and improper food. Sometimes, however, it is caused by a lack of necessary care and thoroughness in cleansing the vessels containing the milk. Sometimes, also, by leaving it too long exposed to the odors of the barn.

Prof. Ingersoll.—What do you consider to be the value of permanent pasture for stock?

Mr. Preston.—I regard June grass and white clover as the very best of pasture, and it yields the largest quantity per acre. I regard it as a mistaken idea, that an old pasture must be plowed: better put a harrow upon it and give it a top dressing of plaster.

Asa Mitchell.—I have a piece of land that has been cleared thirty years; after one crop it was self-seeded; since that time it has been pasture. There are six acres of it, and it yields more and better pasture than any other ten acres on the farm.

Some one asked Mr. Preston whether he would feed turnips to milch cows, to which he replied that he would not feed them any kind of turnips that he had ever seen yet, as they would invariably taint the milk. He thought nothing so well supplied the place of grass as green corn and wheat bran.

Mr. L. Shepherd, of Olivet, read the following paper, entitled

IS AGRICULTURE A SCIENCE?

Mr. President, Ladies and Gentlemen:—I am aware that this is no new subject, nor one that has not been discussed in all its bearings in relation

to agriculture, with such force and ability by men of experience, it would seem that nothing more could be said upon the subject.

The agricultural papers have long discussed this question of science in its relation to agriculture, or agriculture as a science.

Books have been multiplied upon all the questions that come under this important theme, and we might safely infer that the success of the farmer lies only in following those plans that are in harmony with fixed laws.

It is not my purpose to dwell at length upon this question; time will not permit: but only to direct your attention to a few facts and suggestions, to illustrate what I present for your consideration.

When the pioneers began to clear the forest, it was only necessary to lightly stir the vegetable mould, that the grain could get a hold, and a remunerative crop was sure to follow. But as this virgin soil became exhausted by continued cropping, something more became necessary in order to realize a fair compensation for the labor.

In these times of rapid progress in all the arts and sciences, giving us such a variety of farm machinery adapted to increase the amount of work performed for the time expended, there is no reason why the farm should not be in a better state of cultivation, and the returns be more remunerative than formerly. Our farms are our homes,—it is here we spend our days,—it is here we gain our living, and while one-half of the world is thus providing for its temporal necessities, the other half is anxiously looking to see whether we have bread and to spare; for upon the success of the farmer depends the prosperity of the country. Our aim should be to so increase our farm productions that we may have the means to improve our farms, and adorn our homes. Every one is aware that a piece of clay or loamy soil plowed while wet is very hard and impervious to water or the roots of plants when it becomes dry, and as plants will not grow in soil in that condition, the only economical remedy is underdraining. This plan has not been followed by farmers as generally as it should. The reason, "I cannot afford the expense." One of the best farmers in Seneca county, N. Y., and a pioneer in tile underdraining (Mr. John Johnson), always argued that whenever land needed underdraining, the extra yield of the first crop after often would pay all the expense of the outlay; and I doubt not, some that are here can corroberate this assertion. To dry a heavy soil by evaporation or by a common method of furrow-draining, the absorbing properties of the soil that are essential to bring nutriment to the fibrous roots of plants are destroyed, and the elements so necessary to plant growth are excluded. And this fact is also true, that if a plant is dwarfed for want of root-sustenance, its enfeebled state so weakens its leaf-absorbing powers to drink in the gases so necessary to its development, that failure and disappointment is the reward of the farmer. On every soil it is necessary that the surplus water should be filtered through, by so doing the soil is left porous, and whatever foreign substance it may contain is left for plant growth. Air and heat being as necessary for root-growth in cultivated plants as top-growth, a loose, friable soil is the best. No other occupation calls into requisition so many of the natural sciences as the farmers'. And yet, few appear to realize that his work has any connection whatever with science. In buying a piece of land, we examine (unconscious it may be) its geological formation. Whether the soil is of such a character that in its connection with the sub-soil it appears to be composed almost entirely of inorganic matter, as clay, sand, etc., we call it a poor soil. On the other hand, if it appears to be almost entirely of organic

substance, as muck, we discard that for general farming; the two combined will form what is termed a good soil. Chemistry performs an important part in the labors of the farm. The farmer is the chemist, the farm the laboratory, and his success depends almost entirely upon supplying the soil with those substances that contain the elements for the crop, and by tillage and the action of water, air, and heat upon them, the gases formed by this new combination form the food for plant-growth, and for its perfection.

Prof. Johnson, in his work on Agricultural Chemistry, in explaining the action of gases, as of ammonia and nitrogen that is in the air, on the growth of plants, cites as an illustration, that if two farmers side by side, the one with better cultivation and more luxuriant growth of crops, would adsorb not only the ammonia and other gases in that field, but would draw these very elements from his neighbor's, enriching the better crop at the expense of the poorer.

Allowing this to be the case it would be a great incentive to farmers to strive for the ascendency in having a rich soil and thorough cultivation.

In farm management we reason from causes to effects, and so plan our operations. Botany is called into requisition as we study the character and habits of growth of the grain, the grasses, and plants which we raise, while we may be ignorant of how to analyze them or classify them in their natural order.

Two other important sciences are being rapidly developed, viz.: Entomology and Pomology.

As our country grows older, each year seems to bring some new insect enemy to injure and destroy our crops. It is important to learn their habits that we may destroy them or prevent their ravages. Pomology is important in connection with the farmer's profession. No farmer can excuse himself in being without a variety of fruits at all seasons of the year. These delicious luxuries and necessities should be found in abundance on every farm. But they need attention and proper cultivation. None can question the fact that the better these sciences are understood and applied there will be more enjoyment in farm labor and more satisfactory results.

No one can adopt a system of farming unless his farm is first prepared, either naturally or by artificial means, to carry out a plan of regular rotation, which is the only correct and sure method of keeping up the fertility of the land. It is true that very good crops are raised in succession, for a time, if the soil is rich in the elements for those crops, but ultimately, the failure will be sure to come. Our banks are not in the habit of discounting beyond the deposits. A farmer, by adopting a system whereby he increases the average of his crop, is not likely to fall back to the "make do" and "no method" way. He will not be satisfied with a merely perceptible increase in the yield, but he sets his mark to the highest limit, and at that he aims. In breeding and feeding stock, he discards the common coarse-boned cattle that, at three years old, will weigh 800 lbs., when with the improved breeds, at two years old, with less corn, he can have them to weigh 1,000 lbs., and worth one-third more per lb. He is not satisfied to raise such swine as, at one and a-half years old, with no limit to the amount of corn consumed, will weigh 250 lbs., when with the improved breeds, at nine months old, they weigh 300 lbs. He cannot afford to raise sheep that shear $2\frac{1}{2}$ to 4 lbs. of wool, when he can as cheaply raise the improved breeds, that shear from 5 to 10 lbs. of wool, and worth more per lb.

This question of a higher standard of farming, and the improvement of stock

is each year becoming more important. That farmers are more generally being awakened to it is evident from this fact that our agricultural fairs were never so well attended as now, with the horse-racing left out. The exhibition of farm products were never so great, and the standard of excellence was never so high. With these facts before us, we have great reason for encouragement. It shows that the prejudices of ignorance and indifference are fast being overcome. Can we stop now and turn our steps backward? The rapid development of the new West, with its deep rich soil and luxuriant growth of crops, must add a new impetus to our energies to compete with them in the markets of the world, and improvements of the age. We must place ourselves upon that noble and inspiring platform, "*System, Progress, Improvement*." Our labor must be systematic, directed by intelligence. The brain and the hands must be co-workers in the elevation of the standard of our calling. In these depressing times, when the products of the farm are sold at extremely low prices, it is the more important that farmers should have these meetings, with a free interchange of opinions upon the best methods of farm management. Agricultural societies, granges, farmers' clubs, or whatever name by which they may be called, should be organized and supported by the farmers in every township. Stated periods should be fixed for these farmers' meetings, and very much in this way can be done to encourage and awaken a deeper interest in our work. Agricultural papers should be more encouraged and patronized. They are the disseminators of the great fundamental truths that lie at the foundation of farming, and no farmer can afford to be deprived of their weekly visitations to his fireside. The systematic farmer does not satisfy himself in selfish present gains. He has a pride in his well-tilled fields and the merits of his improved stock, beyond their value in dollars and cents, besides the noble satisfaction that to his posterity he leaves a farm rich and full or all the elements that bring ample remuneration for the labor bestowed.

We sometimes hear the remark that "Farming don't pay." But who are those that make this complaint? Are they those that take a pride in their profession as farmers? Are they those intelligent and persevering men that see far enough beyond self to know that when commercial reverses, panics and bankruptcies sweep over the land, that if they are true to their profession as farmers, this sign upon their door-post insures them immunity from these scathing destroyers of men's brightest hopes? Some may say this is fancy, and easy to talk about, beautiful in theory. Still there is the reality. These are questions that must be met and solved. This is, brother farmers, why we have met here to-day. This is why the farmers of Eaton county have invited the able and experienced professors of our State Agricultural College to meet with us at this time, that in their theories, combined with their practical experience on the college farm, they may give us the true methods of scientific or systematic farming.

A short essay was read by Mr. J. Dean, Jr., on the "Discipline of the Farm." Mr. Dean, though confessedly not a very enthusiastic farmer himself, set forth in a very pleasant manner some of the things connected with farming which were not only conducive to physical culture, but furnished also good moral and intellectual discipline. After the reading of this essay a recess was taken till 1 o'clock P. M.

AFTERNOON SESSION.

Prof. W. J. Beal gave a lecture on the "Improvement of our Grains, Fruits and Vegetables," (see lectures given at more than one Institute).

Mrs. Ellis, of Kalamo, next read a short essay on

HOUSEHOLD ECONOMY.

The essayist advocated system as essential to proper housekeeping, while claiming that it was more difficult to be systematic in housekeeping than in almost anything else, there being so many liabilities to interruption.

The importance of a good garden to the farmer's household was set forth as being enhanced by remoteness from market.

The essayist took a very correct and liberal view of household economy, in claiming that it was a false idea of economy to be deprived of things that pertained to the growth of character and the culture of the mind, or that would bring needed rest for the body, merely for the sake of saving money.

Mr. John Griffin, of Olivet, read the following essay on

"THE EDUCATION OF FARMERS' CHILDREN."

To the casual observer it might appear that the education of farmers' children, in the State of Michigan, at least, is well provided for. To substantiate this assertion it can be asked, and with pride, too, what State has a better educational system than ours? In what State is the district school, the high school, the academy and college found more frequently than in our own?

And certainly, as far as the provision of money is concerned in the education of our children, we have no reason to be ashamed. But in the education of the young there are other influences necessary to be thrown around them which can not be purchased with money. The consideration of those influences will form the topic of this essay.

If a true account of the moral, intellectual and social condition of the children of our country were given to us, we should be surprised to note the deficiencies of our children in these respects. It would be found that if they had ever been taught it, they had entirely forgotton the maxim, "Honor thy father and mother." It is a common occurrence to see families in which all filial respect on the part of children is entirely ignored. It is a noted fact that children are to be found in the families of prosperous farmers, whose moral characters are far below what they should be. This should not be the case, as farmers, being more isolated from the world than people of other professions, can exercise a greater influence in moulding the characters of their children than any other class of people. It certainly is of the greatest importance that that influence should be a right one. Parents are often to blame for the vices their children possess. If you hear a boy use profane language, it can usually be traced back to the parent, and if you find a young scapegrace who visits orchards and melon patches in search of plunder, there is a strong probability that his father did so before him, and has related how cunningly he did these things when a boy himself. I will venture the assertion that more than half the bad boys are made so by the example and teachings of their parents. Parents, have you ever seriously thought of the influence your character and and teachings have over your children? If in such observation you find anything wrong in yourselves, try immediately to correct it, for procrastination may result in irreparable evils. Some one may ask how will you do this? How

would you make my children good and lovable? It would be presumptious in me to undertake to tell all that should be done, but I will suggest one thing, at least, that will be an influence in the right direction: that is, teach your children to love the beautiful. Teach them to look for it in all their surroundings. Many farmers look at a thing of beauty only as a thing out of which more money can be coined. To such people a fine animal is beautiful only because it brings its owner more money, and a beautiful tree, flower or shrub, if not possessed of an intrinsic value, fails to attract their admiration. We are too apt to educate our children into mere money-making machines.

Encourage your children in the cultivation of flowers. Give them a piece of ground to call their own, and encourage them in its cultivation. I would not have them cultivate flowers exclusively, but let them raise fruits and vegetables, and give them the proceeds of their sale, so that the love of the beautiful and the desire for an independence may go hand in hand, as established principles in their characters. It is surprising how soon they will appreciate such things. It is a fact that as a love of the beautiful increases, a dislike of everything despicable increases in the same ratio.

Some may acknowledge that they are negligent in the moral training of their children, and still think that they are doing all that can be done for their intellectual advancement. As far as the provision of schools are concerned, may be we have done our duty; but this only constitutes part of what is necessary for their mental training. Children need the encouragement and sympathy of their parents at every step they take in their studies. How many parents are there who give their children this help? How many parents visit the schools in which their children are being educated? I venture to say that the district schools of Michigan will not average three visits to the term.

We should be considered very neglectful of our interests if we employed a shepherd to take charge of our flocks and never went to see how he was discharging his duties. But we do employ teachers to take a far more responsible charge, without giving further thought to the subject. It is often the case that incompetent teachers are employed to instruct our children, whereas if the same degree of incompetency was manifested in a farm hand, we would immediately discharge him. In other cases, competent teachers fail of doing the good they might from a lack of coöperation on the part of parents.

I would have you teach your children true politeness. There is a prejudice existing in the minds of some against this. They term it "putting on too much style." Politeness is not always rightly understood, being frequently confounded with affectation. True politeness is an unselfish regard for the feelings and comforts of others. It is so natural for people to be selfish in this world that parents will find it to be one of the most difficult tasks they have, to restrain this propensity in their children. The mother who has been able to restrain selfishness in her children, has accomplished a noble work that will go down to future generations, long after she has passed away.

Lastly, though not least, I would advise you to be mindful of the health of your children. Remember the adage, "An ounce of prevention is worth more than a pound of cure." If you are not conversant with the laws of health, get some good work on hygiene and make it a study. You will find it a profitable investment, which may save you much anxiety and many long doctor bills. Read the reports sent out by the State Board of health; they will give you light upon things which you have not thought of before. In fact, it should be the great object of life with those who have children, to provide for their moral, intellec-

tual, spiritual and temporal welfare. I would lay more stress upon the first three qualities than upon the last. Although it is necessary to provide for their temporal welfare to a certain extent, it will hardly be necessary for me to urge it upon you. It is now the controlling influence with the majority of farmers. The almighty dollar is the main thing they are striving to acquire, and that, too, ofttimes at the expense of honesty.

What is to be done with this almighty dollar? Why, it will be kept for a few years, and then we leave it to our children. How will it be used then? If those children have been properly educated it will still continue to do good in the world; but if, on the contrary, their education has been neglected, that property you have grown grey in acquiring will be squandered as the spendthrift squanders it, or hoarded as the miser hoardes it.

It would be well if public attention were directed more to this subject. If it could be made practical, I would have a premium offered at our fairs for the best behaved children. I would have another for the best district school; and in place of the premium offered for the handsomest young lady, I would give one to the best behaved one. And so also the family that conducts itself and surroundings according to the best laws of health, should have a little public attention in the way of a premium.

Now, in conclusion, brother farmers and others, I will ask of you to give this more than a passing thought. If, according to your judgments, there is a need of improvement in your families, let this, the commencement of the new year, be the accepted time to institute the reform; so that in the end, it will be said of you, "Well done, good and faithful servants."

DISCUSSION.

Hon. C. A. Gower, Superintendent of Public Instruction, was called upon. The following is a brief abstract of his remarks:

In holding teachers' Institutes, it is important that I should know the wants of the farmer, and I hope that there will be such freedom of discussion here that I will learn a good deal in this line. No Farmers' Institutes were held when I was a farmer, and this is the first I ever attended.

In farming there is greater division of labor now than formerly, and there needs to be better information. That which once served well enough, would now drive a farmer to the poor-house

There is a common impression that I believe to be true, viz.: that we are crowding our children forward too fast. Popular desire is too urgent for pressing forward. Where one complains that his boy is pressed forward too fast, fifty complain of their children being kept back.

Mr. Gower recommended a change of the superintendent system. Township superintendents are often incompetent. If we have examination well done by a board of county examiners, the visitation might be left to the township superintendent. The scheme was suggested at the State Teachers' Association, that township superintendents select a board of examiners, and so take it out of politics and leave it to the people.

Prof. Fairchild spoke of the teaching at the Agricultural College. He explained that the course in English composition and also in French were used as a means of mastering English.

Mr. N. P. Green gave an unwritten address on the topic,

"IS FARMING A SUCCESS?"

Mr. Green claimed that at the present rates of interest a young man without capital could not purchase a farm and both make his living and pay the interest of the purchase money, off the proceeds of the land.

In the discussion that followed this address it was evident that some of the farmers present took a different view of the matter. Mr. T. D. Bryan stated that he came to Michigan a good many years ago, without capital, and bought a farm. He had now four farms, all paid for, and a good deal of the purchase money he had hired at 10 per cent.

Mr. Frank P. Davis, of Vermontville, read the following paper on

"HIGHWAYS AND BRIDGES."

In presenting this paper we shall not attempt to go into the general science of roadmaking; nor do we expect to present much that is new. The subject of roadmaking has been very thoroughly written up by men who have made it their life work, and all that we can attempt to do in the time allowed is to show how a road that will keep in fair condition during all seasons of the year, can be constructed and kept up with no other materials than the clay and loam of which our common roads are made.

The questions of alignment, grades, bridging, etc., which will arise, must be settled by a careful study of each particular case, by a competent engineer who should prepare a profile of the surface of the ground and establish grades, both for the surface of the finished road, and of the side drains. If the work is let by the job, he will also see that the contract is fulfilled, and upon his estimate the contractor will draw his pay. If the road is built by highway labor, the foreman or overseer must see that the work is done in strict accordance with the profile.

The foundation of all good roads is thorough drainage. This can generally be secured by making the side ditches straight, continuous, and on a true grade, that no hollows may be left to become standing pools after every shower, soak-into and under the road, to the certain ruin of its surface.

The side drains must have free outlets into natural water-courses as often as possible; one principle to be strictly adhered to is to get rid of all water as soon as possible. We have frequently seen small streams turned out of their natural course and carried alongside the road in ditches. This ought never to be done, as the water will be absorbed by the subtratum of the road, and frost and travel will soon break up the surface and render it unfit for use.

All public roads in this State are required by statute to be 66 feet in width, which is nearly twice what is necessary; under ordinary circumstances, a width of 20 feet in the center is sufficient to accommodate all the travel; add 5 feet on each side for ditches, and 3 feet on each side outside the ditches, and it gives a total width of 36 feet. For level ground this is ample, and any width beyond is not only a waste of land but a positive damage to the road and the adjoining farms, as it soon becomes covered with a crop of vile smelling and unsightly weeds, which keep the ground moist and porous, and prevent the sun and winds from having free access to the road.

The road-bed must be highest in the middle and descend gradually each way to the ditches. For such a road I would recommend a slope of 1 foot in 15, which will give a rise in the center of 9 inches, or 21 inches above the bottom of the ditches. This form is recommended in preference to an arc of a circle

or ellipse, as being more easily formed and as giving better drainage to the center of the road.

The ditches should be one foot deep and a foot wide on the bottom, with side slopes of 2 feet, horizontal, to 1 foot vertical, and ought never to have a fall of less than 1 foot in 100 feet lengthwise of the road, though less will answer if the ditches are very evenly graded on the bottom. If the road does not have sufficient fall the ditches must be made deeper at their lower end. Of course where embankments occur the width and depth of the ditches must be varied to suit the ground. Through swamps and marshes the ditches ought to be at least 3 feet deep, with good outlets. Wherever springs occur, tile drains, laid at least 4 feet below the surface should be used and the surface thoroughly drained before any attempt is made to build the road.

All road building ought to be done during the months of July, August or September, as the ground is then dry and in condition to form a smooth and hard surface at once.

If the grades have been carefully arranged, nearly all of the grading can be done with the plow and scraper, but great care must be taken to spread the dirt as evenly as possible and to give the road as nearly the required slope as may be. After this is done the dirt must be thoroughly pulverized and smoothed down with the harrow, and any small unevenness removed by the hoe and shovel.

After harrowing, a roller weighing about two tons should be drawn several times over all parts of tne road, and this followed by a steam road roller of the Aveling & Porter type, weighing from twelve to fifteen tons, which will compress the dirt to a depth of ten or twelve inches so as to render it almost impervious to water if properly drained. The side ditches should be cleaned while the rolling is being done and the dirt used to level up low spots. The rolling and leveling ought to be done several times within the first two or three months; and especially after the first rains, all ruts being carefully filled before each rolling.

I want right here to impress upon you the two important points in roadmaking, viz.: thorough drainage and persistent rolling. For small culverts there is nothing superior to fire glazed sewer pipe. For larger streams plans had best be prepared by the engineer.

You will observe that I have confined myself entirely to roads constructed of materials which are everywhere at hand. Of course, if a covering of good gravel one foot in depth can be had, the road will be much improved, but without it there is no excuse for having our main thoroughfares nearly impassable for months, as they were last winter and spring.

The exact cost of constructing a road, as suggested above, cannot, of course, be determined, some miles costing more than others; but we give below an estimate prepared by T. J. Nicholl, C. E., of Chicago, for a similar road, which will not be far out of the way:

"Engineering, laying out and superintendency	$25 00
12,000 yards' excavation of ditches, @ 10c	120 00
Say 300 yards extra embankment, @ 10c	30 00
3,000 feet B. M. Oak bridging, framed, @ $30,	90 00
Rolling	10 00
Cleaning up and leveling off	10 00
Total per mile	$285 00

"The cost of a 15-ton steam road roller would be about $5,000, delivered. Cost of operating same, labor, fuel and repairs, $5 per day; width rolled, 6 feet; average speed, two miles per hour. At this rate it is safe to estimate they will roll 2 miles per day, over a surface 20 feet wide.

"Roads made with these rollers will require repairs like all others, but they will not be expensive, consisting of filling up ruts and holes with good materials and rolling."

Suppose it costs $300 per mile to build such a road, and that the expense was borne by the property owners on each side of the road for a width of one mile; this would make a tax of only 23½ cents per acre, or $18.75 for each 80-acre farm.

General W. S. Rosecrans has shown that the value of lands depend on their distance from market and the expense of hauling 100 lbs. of produce over one mile of road. We would be glad to present his reasoning and some facts which he has pointed out, but time will not permit. Assuming the annual average products of an acre at 1,200 lbs. of crop, with an average value of $1.35 per hundred, and costing 75 cts. per hundred to produce ready for market, interest being 6 per cent., it can be shown that a difference of one cent in the cost of hauling 100 lbs. a mile, at a mile from the market makes a difference of $2.00 per acre in the value of land, and that a difference of 1-10 of a cent in the cost of hauling 100 lbs. one mile, at one mile from the market, makes a difference of the 23⅓ cents per acre which the improvement in roads suggested would cost. Thus you see a single mud hole in the road over which you haul your produce, may lessen the value of a farm several times what a good road costs. How long the farmers of Eaton county can afford to haul their produce over poor roads we leave you to decide.

As wooden bridges are fast being replaced by iron structures, it becomes a matter of some importance, financially as well as for safety, that only first-class bridges are built. Too often, on country roads and in the smaller towns, this is not the case, and taxpayers will find to their sorrow before many years have elapsed, that they have been most shamefully swindled. The specifications of one prominent bridge building company, for country bridges, are as follows: The bridge shall be capable of sustaining a load of about 65 lbs. per square foot of floor surface, over the whole or any part of the bridge, or shall pass a log cart carrying 15,000 lbs. on two wheels, in addition to the weight of the bridge, without straining any piece to exceed 10,000 lbs. per square inch, or one-fifth of its ultimate strength, and when fully loaded the bridge shall not deflect more than 1-1200 of its length, and when the load is removed shall return to its original camber.

Were this test applied to the iron bridges of Eaton and adjoining counties, many of them would fail entirely. They will stand for a few years, until some extra load comes upon them, or a crowd gather to witness a boat race, a baptism or something of the kind, and Dixon and Ashtabula will be repeated with all their horrors.

Do you ask who is to blame for this? I reply the highway commissioner. He is the person appointed by the people to look after their interests, and they have a right to expect that he will know that their money is judiciously expended. Unless he is a practical engineer he is no more competent to decide upon the merits of the plans presented at a bridge letting than he is to design a steam engine or construct a railroad. If the towns were involved in a lawsuit he would not attempt to manage the case himself, but would consult some

attorney. Here only money is at stake; but where the lives of hundreds may be imperilled, he blindly goes ahead and assumes to pass judgment upon matters about which he knows nothing, and almost invariably accepts the lowest bid, whether good or bad. So generally is this understood among bridge builders that first-class companies will not put in a bid at country bridge-lettings unless they are specially asked to and assured that a competent engineer will be employed to examine the plans presented. The specifications of second-class bridge builders, like patent-right and lightning-rod notes, are most carefully drawn, to deceive the commissioner and protect those perpetrating the fraud. In examining the plans presented at a bridge-letting, we were struck with the utter want of proportion in the different parts of one plan, and asked the superintendent of the works putting in the bid what engineer designed their bridge. "Well," he replied, "we thought as the span was small (about 50 feet), we would guess at it and get as near the right thing as we could;" and because the price was low the commissioner had awarded them the contract. That same company have done work in Eaton county. Do you, as taxpaying farmers, want your money thus squandered?

In the design of an iron bridge guess work ought never to enter; the maximum strains to which any piece of a well designed bridge can ever be subjected are capable of as exact determination as the weight of a load of hay or a bushel of wheat.

One object in presenting this paper has been to show the necessity of employing skilled labor, and until it is done we shall not be without poor roads and unsafe bridges.

I would suggest that in place of township highway commissioners, an engineer be employed by the county, who should have entire charge of all roads and bridges in the county, and who should devote his entire time to the work, preparing plans, profiles and estimates of work to be done, and all highway work be let by him, with the advice and consent of the board of supervisors, to the lowest responsible bidder, and that all highway taxes be raised in money, thus allowing the work to be done at the best season of the year, which now cannot be, as the farmers must attend to their harvests and sowing at that time.

If this paper should call out any better plan we shall be more than repaid for our efforts.

DISCUSSION.

Mr. Strange.—This is an important subject. We should pay more attention to the material with which our roads are made. A layer of gravel is a great improvement to a road, and were it more used a great waste of labor would be saved. If our roads were made as narrow as is recommended in the essay, would we not have more trouble with snow drifts?

Mr. Barnes.—Is not running water on roads very objectionable?

Mr. Davis.—It is, but water on the road will be absorbed whether running or stagnant; the quicker it can be drawn off the better.

Mr. Clarke Foote, of Vermontville, gave a short extempore address on his experience and observation as a farmer, which closed the afternoon session.

EVENING SESSION.

Mr. D. F. Vickery, of Benton, read the following paper on

THE BEST BREEDS OF SWINE.

After giving a brief description of the scrub breed of hogs, which he regarded as worse than worthless, Mr. Vickery said:

I will now proceed to describe the breeds that I think are the best. Wm. Smith of Detroit, the largest swine breeder in Michigan, says: "After experimenting with the various breeds or varieties common to the country, I have discarded all but the Suffolk, Essex and Berkshire, they being the only standard thoroughbreds, and in my opinion the three best, most desirable and profitable breeds, combining more good qualities than all others, and certainly possessing the greatest degree of merit for improving other and common stock."

I have never experimented with but two breeds, the Berkshire and Suffolk. There is no essential difference between the Suffolk and Essex except in color. The Suffolks are pure white and the Essex jet black.

I don't know that I have any preference between the Berkshire and Suffolk for crossing with the common swine of the county. Either cross is a great improvement, but I think it pays better to breed nothing but thoroughbreds. It costs a little more in the beginning, but it takes so much less to fatten them that the farmer is a gainer in a short time.

For the market, either one of these breeds is about as good as the other, but for pork for family use, I greatly prefer the Berkshire. The hams and shoulders are large in proportion to their body, and they possess a much larger proportion of lean than any other breed of swine, even the side pork is well streaked and marbled with lean. The flesh throughout is very tender, sweet and juicy. If lard is what is sought, then the Suffolk is preferable. Wm. Smith says, a well fattened Suffolk is an animated lard-tub, and that is so. His flesh is also very tender, sweet, and delicate. The Suffolk has a small head, fine small ears, small bones, and but little offal. He is a good feeder and will fatten at any age, and is a very desirable hog.

To make swine breeding profitable, they must have comfortable, well ventilated sleeping apartments and be fed regularly. I find it is most profitable to cook the feed and feed it warm in winter-time. My feed this winter consists of one-half coarse middlings, one-fourth fine middlings and one-fourth corn meal, made into mush and thinned with water to about the consistency of cream when fed. It costs me about two and a half cents per head a day to keep my swine, and they are in good condition. I also keep them supplied with ashes and coals, that keeps them healthy. I find that sows in good flesh produce larger, stronger, more even and larger litters of pigs than thin ones. I think it is very poor economy to let a hog get thin, the pork is never so good. I forgot to mention the size of my hogs that I am keeping for two and a half cents per day. I have a few shoats about three months old, that will weigh about seventy-five or eighty pounds, the rest will range from two hundred and fifty to five hundred pounds.

Care of Sows while Nursing Pigs.

Sows should be liberally fed while nursing their young. I find that corn and oats ground together and made into mush and thinned with milk is the best of feed,—give them all they will eat three times a day, and they will nurse ten

or twelve pigs and will not fall away. Pigs will begin to eat when about two weeks old; they should have a trough where no large hog or other animal can get to it; they should be fed bread and milk or scraps from the table, corn and oats ground together, cooked, and added to their milk, but no other slops should be given them, for it is apt to scour them.

The Origin of the Improved Berkshire Swine.

A. B. Allen, in his prize essay on the "Origin and Management of Berkshire Swine," says:

"Tradition, and the earliest published accounts of what has long been particularly distinguished by the name of Berkshire Swine, represents them down to about a century since, as among the largest breeds of England, weighing when full grown, from 700 to 1,000 pounds or more. "Originally they were represented as being a buff, sandy, or reddish brown color spotted with black. They were coarse in the bone, head large, broad on the back, long bodied, large hams and shoulders. Their meat was marbled to a greater degree than that of any other breed of swine in Great Britain.

"Swine history tells us that the Berkshires were much improved more than a century ago, by a cross of the black Siamese boar with the old unimproved Berkshire sows."

Description of the Improved Berkshire Swine.

They may be described as follows: Color,—black, white feet, white blaze in face, tip of tail white, snout and head fine and rather short, face dished, ears small and thin, eyes bright and expressive, chest broad and deep, back broad, shoulders heavy, hams broad, round and deep, offal very light, skin thin, hair fine, soft and silky; withal a very stylish beast, and every way perfect.

DISCUSSION.

Prof. Ingersoll.—I notice your feed is middlings and corn meal made into a mush. Do you allow it to sour before feeding?

Mr. Vickery.—For young pigs, I feed it sweet. It is apt to scour young pigs when sour. For older hogs I let it sour first. It makes a better food. Do not make it into a porridge, but let them eat it in form of a thick mush.

Question.—How much will hogs increase in weight a day?

Mr. Vickery.—I cannot say. Have never weighed to see.

Mr. Danforth.—I have tried some experiments on that point. I fed my hogs on boiled potatoes, and they gained 2½ lbs. per day. Weighed them about once in two weeks. My hogs when let out of the pen, would go straight to the scales. The reason was there was always corn there for them. [Laughter.] The largest increase I got was three pounds per day.

Prof. C. L. Ingersoll gave a lecture on Breeds of Cattle. (See lectures given at more than one Institute.)

Mrs. D. Eddy, of Eaton, read a short essay, entitled a "Talk About Flowers," in which she discoursed pleasantly regarding the beauty and influence of flowers, and Mr. F. E. Andrews, of Bellevue, read an essay,

CLOVER AS A CROP AND FERTILIZER.

The essay was a strong vindication of this plant for its renovating and recuperating properties. Wheat culture is exhaustive, but clover is the greatest root

fertilizer known to our system. When sown and turned under it is equal to a large amount of manure. When fed off and then the aftermath turned under it is almost equally as good as when a full crop is ploughed in. It is said that the roots of an acre of well set clover contain 185 pounds of nitrogen, 240 of lime, 45 of magnesia, 75 of potash, 19 of soda, 24 of sulphur and 70 of phosphorous acids, upon which the roots of other plants can luxuriate.

The following resolutions were presented and adopted by a rising vote:

Resolved, That it is the sense of this meeting that the Legislature should, at an early day, make the necessary appropriation to erect suitable buildings on the Agricultural College grounds in order that our daughters as well as our sons may be educated at the College.

Resolved, That the the thanks of this community are due and hereby tendered to the State Board of Agriculture for appointing an Institute at Charlotte, and to the Professors of the College for their efforts to make it successful: also to the ladies and gentlemen who have contributed to the interest and profit of this meeting by the essays which they have presented and the part they have taken in the discussions.

Resolved, That we cordially endorse the system of holding Farmer's Institutes, believing them to be of great importance in helping forward the agricultural interests of the State, and in improving the character and intelligence of our citizens.

Hon. O. S. Barnes, Representative from Eaton Co., made some remarks in support of the resolutions, in which he spoke of the work being done by the Agricultural College as of great value to the State.

Prof. Beal responded in behalf of the College, after which the Institute was declared adjourned.

FLINT INSTITUTE.

The Genesee Co. Farmers' Institute was held in the High School Hall, in the city of Flint, on Thursday and Friday, January 16 and 17.

Hon. Sumner Howard, President of the Genesee Co. Agricultural Society, presided. Hon. F. H. Rankin was elected Secretary, and Hon. C. H. Rockwood and Henry Schran, Vice Presidents.

Mayor Eddy and Messrs. J. C. Dayton and H. R. Dewey were appointed a committee on entertainment.

The first evening session was opened with prayer by Rev. Geo. P. Tyndall, music by the Fuguenoids, and a brief informal address of welcome by President Howard.

Hon. Wm. Newton was then called upon, who gave the following address on

THE FARMER—HIS POSITION AND DUTY.

The sources of a nation's wealth are its lands and its productive labor; from these grow all other trades and occupations. Art, navigation, ships, railroads, and all else that contribute to produce the greatest amount of wealth by the least

amount of expenditure, are but the answers given to the land and to labor; and, as we shall be obliged to confine our views to the American farmer, a brief consideration of that he cultivates becomes necessary. Less than four hundred years have elapsed since the eye of civilization first discovered, and its foot pressed the Continent that should become the home of the millions who now occupy it, and who in that portion of it called "Our Country" now number about forty-seven millions, and will in twenty years number approximately seventy or seventy-five millions of people. The hand that planted the standard and unfurled the banner of Spain on the newly-discovered continent, also planted by its side the banner of "The Cross," the highest type of her civilization. In view of the discouragements met and overcome by the grand old man, as he laid his theory of "Land to the Westward," before kings and men of science—it being regarded by them as the dream of a visionary enthusiast—it can scarcely be a matter of doubt at this day, that He who made the sea and dry land had designed this continent to become the nursery and abode of the highest civilization and culture.

The new land became the abode of a hardy, self-reliant, frugal, and educated people, the most of whom became workers of the soil, and at the same time owners of the land they occupied.

In England, a farmer is defined to be a "tenant, a lessee, one who hires and cultivates a farm, a cultivator of leased ground." In the United States he is defined as "one who cultivates a farm, a husbandman, whether a tenant or the proprietor." The land system of the United States is so unlike that of Europe, that the name of farmer in America is suggestively associated with the idea of the ownership of land. At an early period the Government made wise legislative provision, that enabled the poor and industrious man to possess and own a sub-division of public land not less than forty acres, for the small sum of one dollar and twenty-five cents per acre, as a general rule. This system stimulated the ambition of the laborer to become the owner of a parcel of land from the public domain; to make it his home, to work it, and make it a part of the study and enjoyment of his life. Each of these added new homes, and established from time to time the outposts of advancing civilization; and they became the picket guards on the frontier, limited by their own title.

The farmers and those who till land constitute a large majority of the people of this country. Those who own land are happy in its possession; those who do not now own land expect and hope soon to do so.

The glory of the farmer is, that in the divisions of labor in a civilized state, it is his part to *create or produce;* on his primitive activity all trade rests for success. He is associated with land, and with its cultivation. From it he obtains the bread and meat and clothing. The food and raiment which was not he causes to be. The first man was a farmer; and, according to sacred history, his profession was assigned him by his Creator as the highest and best of occupations. It is true it was decreed that he should earn and eat his bread in the sweat of his face. As men do not like hard work, it was not an easy edict; but as all men have an exceptional respect for tillage, and as it makes man stand closer to nature, all historic nobility has been made to rest on the ownership and cultivation of land. The charms of the farm are daily incentives to work.

The farmer, therefore, can boast of being a member of the oldest profession. That all other trades rest upon it for success. That it retains all its ancient charms, as standing nearest to the Creator, the first cause. He can joyously

point to the exhilarating beauty of nature, the tranquility and innocence of a country life, in contrast with the sameness of the daily pursuits of city life; and the hideous visage of poverty and crime that mar the history of cities. "God made the country, and man made the town."

Wise and active men look to the farm as an asylum, a place of refuge in old age, or in misfortune to hide his poverty, and from the kind earth to draw sustenance both for body and mind; or, if disappointed in the plans and ambitions of life, or lost in the solitude of his own thoughts, a safe retreat in which he may more readily commune with nature; behold the grand mysteries of her work in the earth, and forget himself in the charms she throws around him, in field, and tree and flower, and in the jeweled firmament above him; or, as an old poet has said:

O, how cans't thou renounce the boundless store
  Of charms which nature to her votary yields!
The warbling woodland, the surrounding shore,
  The pomp of groves, and garniture of fields;
All that the genial ray of morning gilds,
  And all that echoes to the song of even,
All that the mountain's sheltering bosom shields,
  And all the dread magnificence of heaven,
O, how cans't thou renounce and hope to be forgiven!

The man of the city, spoiled by its habits and its vices, and nearly wrecked in fortune, at last turns to the farm, and with his children goes there to be recruited and cured. She should have been his nursery; now she becomes his hospital!

The office and calling of the farmer is precise, and important. He is the minister to the laws of nature: he represents the necessities. We cannot speak of him as we do of the town dandy. You cannot compliment his taste in his toilet, nor in the tie nor color of his cravat, nor in his coat being of the latest fashion in texture or style, nor in the smoothness of the fit of the glove to his hand. No, in these things he cannot be complimented; they are utterly beneath him: and therefore unbecoming. And if he should assume them, he would lose the simplicity and grandeur of that nature which he represents. His calling and his character are too high and far above the city fop, to admit of such folly. *He is nature's minister;* and it is the beauty of the great economy of the world that gives him grace and beauty in all he does. He bends to the order of the seasons, the weather, the soils, and the crops, as the sails of a ship bend to the wind. He is the representative of continuous hard labor, year in, year out. Intelligent, independent, manly, thinking labor, acting for itself, earning its own wages. He is satisfied with small gains, knowing that his *best profits are the improvements his constant toil adds to the value of his land.* He is timed to nature, he does not slop over with enthusiasm, he is slow and sure, he takes the pace of seasons, crops, and chemistry. He knows that nature never hurries; that atom by atom, little by little, she has achieved and is achieving her work. Why should he hurry? He must be patient; he must not travel faster than she who leads him, *but he must travel and move as fast;* he must time himself to nature, and acquire that live-long patience which belongs to her. He has the promise that the earth shall feed and clothe him; and he must wait in hope for his crop to grow. He is a man of strong faith and of great work, proving the one by the other. He ploughs and sows each autumn the staple crop of our northern climate; he has done it in season, and in good order; and while doing it the thought of the harvest time is associated

with his work: whether twenty, thirty, or sixty fold, he cannot know, but it makes his arm and heart strong for his work: the noble work of creating and producing that which shall feed and clothe the millions dependent upon his skill and labor. His faith and trust never grow weak nor cold: they burn as brightly in his heart as the great fire on his hearth. In midwinter, when the earth is solidly bound in icy chains, no distrust enters his heart for the safety of the tender plant that had just peeped out of the earth, up, into the face of the sun, when the snow came down to kiss and cover this dual child of nature and man. He had read of the promised harvest time to him who should sow: and out through the storms of winter he sees the coming spring, when the sun shall pour forth upon the earth, and she shall drink in his rays, dissolving the icy robe, and setting free the young plant to rejoice in the warm spring showers, to glitter and sparkle with the dewdrop, to reach up in the summer, until nature's slow work from rock and earth, and shower and sun, shall clothe the whole field with the golden hue of the ripened crop. This is the farmer's faith, and he is never disappointed. The farmer is the representative of true political economy. He has acquired his knowledge of it without the assistance of Ricardo, Adam Smith, Sir Robert Peel, or other authorities on this subject. He has followed the logic of common sense:

First, "That he who would thrive must himself hold the plow or drive."

Second, To do all things well, and to do them at the right time; and never to trust others to do that which he can do himself, and to be rigidly exact in the supervision of that which is done by others.

Third, That he is the rich man, in the true sense, whose outlay is less than his income, and is steadily kept so.

Fourth, That the wealth of a man is not to be measured by his large income and large expenditure, but by the rule that his expenditures are less than his income,

Fifth, That he who buys what he does not want will soon want what he cannot buy.

Every dollar he earns is the result of constant hard work. It is the farmer's dollar. It represents so much of frost and sunshine, of bone and muscle; so much of toil and sweat. He has drawn on himself and nature for it, and the draft has been honored. His bushel of corn and wheat, his ton weight of beef, and his hundred pounds of wool are as good measures of value as any possessed by the world. Better than any artificial standard that lengthens or shortens at the command of brokers or bank directors. These commodities are his, and the world's wealth; he has produced them by the hard labor of brain and arm, honestly earned, without speculation, fraud or trickery. They are commodities of intrinsic value, that feed and clothe the hungry and the naked. He knows their value and how to appreciate them.

Dr. Johnson said that "men are seldom more innocently employed than when they are making money." The farmer has found out the truth of this statement. Money to use for every beneficent and wise purpose, either public or private, within the rule already stated.

This truth excludes indolence from the farm; the successful cultivation of the land will not tolerate it. A drone can have no place with the successful farmer. The canker-worm of indolence is short-lived on the farm. It may curse and blast the prospects of capital invested in other trades, but the earth rejects the lazy and indolent from her bosom, as unworthy of her love and care; and in a short time some busy worker takes from the indolent the land he was

not worthy to possess. In nature's great workshop the rule is inflexible that he who would eat honey must—like the honey bee—constantly work and gather the sweets from which it is made.

The farmer is kind and hospitable; his entertainments, his liberties, his pleasures and his expenditures are on the farmer's scale, and not on the merchant's or the banker's: but his hospitality ever leaves the string out of the latch to the door on the outside; he welcomes and entertains bountifully the needy. Without ostentation or display he gives without stint of his abundance to the needy, and particularly to those in our new settlements; and he neither asks for nor receives a puff in the newspapers for it. He goes on errands of mercy and love, and with his charities makes glad, in the name of his Divine Master, the poor and sorrowing, "and his left hand knoweth not what his right hand doeth." But in his sturdy faith he hears the voice that said "Inasmuch as ye have done it unto the least of these, ye have done it unto me."

The farmer, above the rewards yielded by the harvests for his toil, has other compensatory advantages growing out of his profession. He is permanent, clings to his land, makes it his home, adorns it, and fills it with plenty; makes the land a part of himself, makes it a part of his children, welds his love and their love to it. To them it becomes a sacred spot. The farmer intends it for his boy, who will bear his name, and continue its occupation. For generations, in the old and first-settled portion of our country, farms have remained in the same families; and should the first settlers in 1635 re-appear on the farms to-day, they would find their own blood and names still in possession. The tenacity with which the farmer clings to the land he first settles is so general, that even in this county and State the children and grandchildren of our first settlers are still in possession of the paternal home. The sentiment that produces this result is a noble one; in many instances inspired by the gentleness and patience of those who in suffering and hardship had planted these new homes in the wilderness.

The farmer has great trusts committed to his keeping. He stands at the door of the bread room, and weighs out to each his loaf, and his pound of beef, and has much to say of the quality and condition of the larder; and early marriages largely depend upon the abundance of food in the market, and the financial ability to procure it; for few will risk so important an alliance where there is a prospect of the wolf of hunger crouching at the door. He is the great conservator of joy and health in the household.

The farmer is the representative and custodian of good health; he imparts its living power and beauty to the cities. Cities are always recruited from the country, the wasted body, the wearied intellect, and the weakened moral forces are renewed by the new blood brought from the farm. The men in cities of all professions and trades, who are the centers of energy, the driving-wheels of trades, of politics, and of the liberal professions; and the women of beauty and genius, are the children or grandchildren of farmers, and are spending the energies which their father's hardy, silent lives accumulated in frosty furrows, in poverty, necessity, and trial. The women need not be ashamed of it. The rose of health upon their faces is far more precious and beautiful than the jewels and diamonds with which they adorn themselves!

The farmer is the world's benefactor. He who clears up an acre of land, digs a well, sets out a grove of trees, plants an orchard, builds a durable house or barn, drains and reclaims a marsh, puts a seat by the road side, sows a bushel of grass seed, plants a rose bush, makes the land so far lovely and at-

tractive, leaves a fortune to others which he cannot carry away with him. He works at home, and helps society at large with more of certainty than he who devotes himself to the giving of alms. And all this he does by his daily labor in the field, investing it in his land, making labor honorable, stimulating, and attractive. By these shall he be remembered. In our Western forest-homes he is more than a benefactor; he is a hero—a man of great moral and physical courage. Michigan and Ohio were largely settled, and are to-day largely settled by a class of men known as small farmers, and who with fifty, or a hundred, or two hundred dollars, took up of the public domain 40, or 80, or 160 acres of wild land. These young men, with true western pluck and vim, took their equally heroic wives with them into the very heart of the forest, with little or no money, without friends to aid them, and many miles remote from human habitation; and there in hardships, toils, and privations, planted new homes, and made them the outposts of advancing civilization. Others came, and soon roads were cut out and made passable, the land was cleared and cultivated, school-houses and churches were built, in which their children were taught the lessons of morality and religion, of virtue, and patriotism. Without these heroic self-sacrifices, much of the poetry of our homes and civilization would be wanting. These men and women taught us the truthful lesson, that "*a man is fed, not that he may be fed, but that he may work.*" The field was at once his floor, his work-yard, his play-ground, his garden, and his bed. There he laid broad and deep the foundations of that patriotism and love of home that made our farmer boys invincible in arms. Their courage and endurance in three great wars, brought us peace, and covered them and their country with imperishable glory.

The farmer has called to his aid the assistance of education, and all the inventions and improvements in agricultural implements within the last half century; and the agricultural colleges of this and other States have added largely to the store-house of his knowledge. With his increased facilities for profitable labor he has largely increased the amount of his productions. His demand for all that aids him in his work, has spurred genius, science, and art in their various departments to meet his necessities. His demand for safe, rapid, and cheap transportation of his abundant crops, has been answered by giving him steamships and railroads. Idle capital has threaded the country with roads of steel for his convenience, equipped them with the motive power of steam, and sends the iron horse with his eye of fire dashing from the center of civilization, through city and town, over valley, through mountain, leaping rivers and ravines, onward to the very door of the remotest habitation, and from thence carrying back to the seaboard the crops, the bread and meat with which to feed the hungry of New York, and New England, and Europe. The puff of the steam engine tells of its power, and is dragging at its back all of Michigan, Wisconsin, and Illinois. It is proving the truth declared by Stephenson, that a half ounce of coal will draw two tons a mile, and coal carries coal to the farmer on the prairie, by rail and boat, as well as the farmer's products, so safely, so rapidly, and so cheaply, that every energy of the farmer is intensified thereby. He broadens his fields, and daily increases the volume of his crops, rendering necessary additional manual help, and affording employment to those who are willing to work. *He serves them, and they serve him.* But the puff of the engine also tells of the power of the farmer, as well as of its own. The capital invested in these roads answers only because the farmer demands it, and makes it profitable for them; and by them the way of civiliza-

tion is broadened and lengthened, and with them the civilizations of the remotest portions of the earth are brought into the closest alliance in the exchange of their products; and the better portion of our civilization is infused into theirs.

But the faithful, constant servants of the farmer are to be found in nature. Among them are Geology and Chemistry, the quarry of the air, the water of the brook and lake, the electricity of the cloud, the plough of the frost.

Long before man stood on this green ball, the sun of centuries decomposed the rocks, mellowed the land, filled it with light and heat, covered it with vegetable film, then with forests. But nature did not expend and lavish all her beauty and power on any one generation. She had great tenderness and regard to the coming generations. Her magazines of power and richness and beauty are inexhaustible. The eternal rocks have held undiminished and entire their oxygen of lime. No particle of oxygen has rusted or become worn, but has the same energy now as on the first morning. It speaks to the farmer and says, "take the gas we have hoarded, mingle it with water, and let it be free to grow in plants and animals, and obey the thought of man."

The earth works for him and is his servant. Every plant is a manufacturer of soil. The tree or plant draws on the whole air, the whole earth, and on the rivers and seas, imbibing nutriment, strength and beauty; by its roots from the ground, by its leaves from the air. It is the reservoir from which all things spring, and into which they all return. The invisible and impalpable air takes form and solid mass, in the plants and trees. They burn, they exhale and decompose their own bodies into the earth and air again. The earth and the animals burn and decompose incessantly. Wonderful mystery! And yet the servant of man.

Nature is strong and wise, she turns her capital day by day; deals never with with dead but ever with quick objects. See the wonderful transformation proproduced by a few hundred rods of tile. Nature responds to the farmer's call for a *change of climate* in that apparently worthless piece of land. He lets off the water which kept the land cold and sour through constant evaporation, and allows the warm rain to bring down to the roots the temperature of the air and of the surface soil. By drainage the roots strike down into a sub-soil full of ripening power; and richness and beauty reward the husbandman. These tiles by association are political economists. Confuters of Ricardo and Adam Smith, they are full of learning; they speak daily the words of promise, announcing a better day —"*more bread.*" They drain the land, make it sweet and friable, have made some of the veriest swamps to groan under the burden of the growing and matured crop, converting a dismal and forbidding fen into a garden. The farmer learns that the earth works better for him than he can work for himself; works for him when he is asleep, when he is sick, when it rains, when it snows, when heat overcomes him. The heat that prostrates him, lifts up and matures his corn. These reclaimed lands are the best, when the wash of mountains has accumulated the best soil, which yield a hundred fold the former crops. But it needs numbers, patience and perseverance to accomplish this reclamation, *and it pays to do it.*

The sun and the sea are the farmer's servants. They wait on him. Without them the other aids would serve him in vain. The sun and the sea: they furnish him light and heat and rain. We eat and drink, in one form and another, the moistures that drop from the clouds. Animal life is fed from the clover, grass, and corn, in which the rain and dew are transmitted; and

we feed upon the vegetables at the second remove, and upon the animals at the third remove, from the water of the showers and the storms.

Greek mythology has a picture of the Goddess of Beauty as born from the foam of the sea. This is an imperfect statement of the scientific fact that all natural beauty, all the verdure of meadows, all the foliaged grandeur of trees, all the glory of blossoms and flowers, rise out of the sea, are transformations of the moisture which the sea gives to the air. Job asked, "Hath the rain a father?" A brilliant American has answered, "*The rain is the daughter of the sun and the sea.*" And it is almost the life and substance of all that clothes the earth, and feeds its countless multitudes. This tasteless rain is a mystery. It was tempted by the sun out of the salt reservoirs of the ocean, and transmitted into that we eat and drink,—not carried to the fields by human agency, but borne in the sponges of the clouds and poured directly upon the farmer's field. It was drawn fresh by the sunbeams out of saltness, and transmitted through trunks and stalks into the apple, the pear, the peach, the plum, the wheat, the corn, the rye, the sugar-cane, the grape, the lemon and orange, and all else that man eats. Most truly the sun and the sea are his servants; and all who eat of the fruits of the earth should gratefully remember the goodness of the Infinite Providence that cares for man. "For he causeth His sun to rise on the evil and on the good; and sendeth rain on the just and the unjust."

The influence of the farmer in society must be measured, as in other men, by the standard of a pure morality. This imposes upon him the recognition of the fact, that the wealth of the State consists not in immense treasures, solid walls of brick and granite, magnificent palaces, nor in her soldiery and armor; but that her best and highest wealth, and most certain safety, is in having her citizens wise, honorable, and well educated. "Population increases in the ratio of morality; credit exists in the ratio of morality." Assuming that the farmer has sought after and attained this high level, even his dollar will represent more of value than some other man's dollar, for money is representative, and follows the nature and fortunes of the owner. It is known to him how many strokes of labor it represents; his bones ache with the days' work that earned it. He knows how much rain, frost, and sunshine it represents. It was not earned by some lucky investment, nor in exchange, nor by gaming on the market, but by hard and honest labor. His dollar is heavy; the gambler's is light and nimble, and skips from his pocket on to games of chance. The farmer's dollar is worth more than the gambler's or the dishonest man's, as truly as a dollar in a university is worth more than a dollar in a prison,—in a temperate, schooled, law-abiding community, than in some haunt of crime, where rum, cards, pistols, and knives are in constant use. Worth more, as truly as a dollar in the hand of a big-hearted, generous lover of his race is worth more than one in the hand of a miser.

The morality, and schools, and churches of a locality, township, or State will draw to it capital and population. These attract; vice repels and keeps both away. Morality affords safety to person, personal rights, and property, and these will go and stay where they will be safe. Temperance, industry, and thrift are potent indexes of the character of the people of any locality. Schools and churches are important factors in building up a new country, and he who contributes most to their support is most benefited in the end. And our farmers have always held them in high esteem and veneration. Our humble district schools have ever been very dear to our farmers, and for a long time were the

only attainable means of education, and as a general rule have been generously supported. These schools are the vestibules to learning, as well as the Gibraltars of liberty. They are peculiarly the growth of the farmer's love and care.

The mighty elements of nature with which the farmer deals, and is in constant intercourse, cannot leave him unaffected or unconscious of his ministry. Their influence on him is much like that which the same nature has on the child, "of subduing and silencing him." We must behold the farmer with respect and admiration when we see how meekly he wears and weilds his power. He is master of every secret of labor; he changes the face of the landscape; he has blessed and made the world better by having lived in it; yet there is no arrogance in his bearing, but a perfect gentleness.

He stands well in his place on the green ball. Plain in manners as in dress, it has been said "he would not shine in palaces; he is absolutely unknown and inadmissible therein; living or dying, he shall not be heard of in them." Yet the lions of the drawing-room, put alongside of him, would shrivel in his presence. He, solid and unexpressive, stamps ineffaceably his own character upon the progress of advancing civilization. He is really a piece of the old nature, "comparable to sun and moon, rainbow and flood," because he is, as all natural persons are, representatives of nature as much as these. He lives in the presence of nature; he knows her vast secrets, and uses them for the good of the world in which he lives. As time and generations come and go, the influence of the farmer will constantly increase, for his calling, now in its infancy, will mature into a perfect system, and he will add more and more to the sum total of the world's wealth and happiness.

Perhaps no granite monument will record and perpetuate the noble deeds of his life, but the fields he has cleared, the swamps he has reclaimed, the outposts of the civilization he has established, the roads and schools and churches he has builded, and the lessons of temperance, virtue, faith, and patience he has taught, will remain as monuments of his life and deeds, more enduring and imperishable than the granite that perpetuates a warrior's fame. No great work in the world is finished by one man, or in one generation. Each in his day performs well the part allotted him, as God gives him to see his work. One digs the trench, another mixes the mortar; one furnishes the material, and another lays block upon block, until the dome crowns with a perfect and radiant finish the work of many minds and hearts and hands. Thus will it be in our civilization, until in its perfect ripeness the earth shall hold up to its Maker as its finest fruit—"MAN."

R. G. Baird, Secretary State Board of Agriculturd, gave a lecture on "Conditions of Successful Farming." (See lectures given at more than one Institute.)

FORENOON SESSION.

Hon. Le Roy Parker read the following paper on

ARBORICULTURE.

The subject of planting and cultivating trees for purposes other than that of producing fruit, may be divided into three heads:

1. For ornamental purposes and shade.
2. For shelter and screens from wind.
3. For the production of timber.

I have thus divided the subject according to the different degrees of attention which each branch of tree culture has hitherto received. I have placed the cultivation of trees for shade and ornamental purposes first in order, not because it is the most important use to which trees can be put, but because the most numerous efforts in the direction of tree planting have always been made for purposes of ornamenting grounds or streets, and for shade; and it is this branch of the subject with which we are most familiar. So generally has the advantage of shade and ornamental trees been recognized by the people, that we see all over our State, cities and villages whose chief beauty consists in the magnificent growth of trees and shrubbery which adorn their streets and the grounds about their private residences. Considerable progress, too, has been made in the country in planting trees along the highways and around farm houses; but it is to be regretted that more attention has not been paid by our farming population to the preservation of the trees which once grew in such profusion, or to planting them anew for shade and ornament. It will be unnecessary for me to dwell at any length upon the great advantage and the many delights of thick masses of shade trees surrounding our houses, or bordering the streets and highways of town and country. You, whose farm-houses are embowered in trees whose grateful shade tempers the fierceness of the summer sun, and invites the tired laborer to his nooning of cool, refreshing rest, can well appreciate the benefits of this kind of tree culture, without any attempt on my part to picture it to you. These benefits should also be appreciated, if they are not, by the dwellers in those homes, too frequently seen throughout the country, which stand bare and unrelieved by any clustering trees or shrubs; where no shade wards off the blistering rays of the sun in summer, and no masses of evergreen foliage protect from the biting winds of fall and winter.

Next to planting trees for shade and ornamental purposes, more has been said and written, and more work has been done, in relation to the cultivation of belts of timber for purposes of screens and shelter for fields and orchards, than for any other purpose. The removal of the forests which has been carried on so vigorously and relentlessly in this country for purposes of clearing the ground for cultivation, and to supply the demand for lumber, has been found to entail a curse upon the country thus denuded of its timber in the shape of sweeping winds and tornadoes, to which the open stretches of plain have given free play; and which have exercised a blighting influence upon the crops of fruit and grain.

The planting of trees for the renewal of the forests which have been cleared away, and the production of timber for mechanical uses and for fuel, is by no means the least important branch of arboriculture, though it has received less attention in the past than tree-planting for shelter and for shade. Its importance, however, is becoming more and more apparent as the vast forests which were once the glory and pride of this country are year by year melting away beneath the stroke of the woodman's ax. In this paper, which must of necessity be brief, I desire to dwell particularly upon the last two branches of the subject to which I have alluded. These are the culture of trees for shelter, and the culture of trees for timber. It may seem like carrying coals to Newcastle to advocate the cultivation of trees and the preservation of forests before

an audience of Michigan farmers, some of whom have spent the best strength of their manhood in clearing away the woods which were once considered as enemies to man, to be smitten with steel and burned with fire.

But as the marvelous change which the demands of trade have wrought has actually carried American coal to the Newcastle market, so the problem of forty years ago, "how to get rid of the timber," is to-day completely reversed, and we are confronted with the graver question, "How shall we restore what we have destroyed? How shall we provide for our old age, and for our children, the timber which will be required to supply the wants of the future?" I know how common it is to say that the forests of Michigan are practically inexhaustible, and that the timber supply will be ample for generations to come; and no doubt many of you, as you go to your homes and look across your cultivated fields to the wood-lot you are saving, will say, "I have enough and to spare." Yet it is a fact, easy of proof, that not only in Genesee county, but in many others of the middle counties of the State, the production of timber for sale has nearly, if not quite, ceased. The pine forests in this county, with the exception of small tracts in the northeastern corner, have for several years been entirely exhausted. The buyers of oak timber no longer look to us for their supply; and the silence which reigns in the disused mills along our river tells the tale of the final exhaustion of the timber production of this county. It was but a few years ago when a dozen mills in this city were sawing millions of feet of pine logs into boards, which were shipped to the Eastern States to supply the lack of timber there. Thousands of the stately oaks in this county were cut and shipped abroad, to be used in the ship-yards on the Clyde for the ribs and planks of English merchantmen; or in the shape of staves and heading, were sent to Spain and Portugal to be made into casks to contain the luscious vintages of those wine-producing lands; while hundreds of acres of woodland have, within a few years past, been converted into charcoal to supply the demands of the iron-smelting works at Detroit. All this consumption of timber has mainly occurred within the memory of the youngest of us here. The history of the timber of Genesee county will, in a few years, be the history of other well-timbered counties lying to the north of us, where there is still a large area covered with trees. With the ever-increasing demand for lumber to be used in building and manufactories, which our lumbermen are only too eager to supply for present gain at the expense of future wants, it does not require a very prophetic eye to discern the day not far distant when the manufacture of lumber will be practically at an end in Michigan, by reason of the exhaustion of the supply; and the people of this State will be obliged to import at great expense, as is now done in the Eastern States, the lumber necessary for building and mechanical purposes.

How great the consumption of lumber will be in the future it is difficult to estimate. With the teeming population of the country rapidly increasing in number, the necessity of constantly building new houses, barns, shops, and factories, and reconstructing the old ones, with the rapidly increasing demand for agricultural and mechanical implements which require the best timber for their construction, with the enormous consumption of wood for railroad ties, fuel, bridges, and cars, with the heavy drafts made upon our forests to furnish ship timber to accommodate the constantly growing tonnage of our lake transportation service, and with the numberless ways in which wood will be employed by the ever-increasing ingenuity of man, it is only too easy to realize that before many years have passed, Michigan forests will be wholly inadequate

to supply the timber which these vast and varied industries will require. It will not be safe to assume that the needs of Michigan can be supplied in the future from other localities where a more bountiful supply of timber exists. It has been the pride and boast of our State that her forests bore a larger percentage of timber trees to the acre than any other section of the Union except the heavily-wooded regions of Oregon and Washington Territory. The census of 1870 showed that the value of the lumber products of Michigan were greater than that of any other State in the Union, by more than $3,000,000. If, then, our timber resources are now larger than those of neighboring States, how can we expect them to supply our deficiency in the time of need, when the same destruction of forests is going on within their borders as in our own. Michigan occupies a central position as regards the density of its timber growth, lying as it does between the well cleared lands of the States east and south, and the treeless prairies of the west; and unless some measures are taken to preserve and renew the forests which are annually being cut to supply the wants of adjoining States, I venture to predict that a generation hence Michigan will not furnish good timber enough to satisfy the requirements of its own industries. That this account of the rapid destruction of our forests is not overdrawn, I quote from a report made in 1867 to the Legislature of this State by a special committee appointed to consider the injurious destruction of forest trees, and the means of checking the evil, of which committee Professor R. C. Kedzie of the Agricultural College, and John J. Woodman, our recent Commissioner to the Paris Exposition, were members. In the course of their report, which was carefully drawn, and shows an elaborate study of the question, the committee say: "With an abundance of valuable forest trees, such as has blessed no other State east of the Rocky Mountains, our people have been disposed to regard this legacy of the slow-paced centuries, not as a blessing to be prized and cherished, but an enemy to be destroyed. Before this blind impulse of destruction, nothing is regarded as worthy of protection. The trees which should adorn the farmer's lawn, shade his home, border his lanes and roads, and afford a grateful shade in his pastures, are all made to pass under the ax. Even trees which would soon bring him wealth, as lumber, are often sacrificed to that insatiate monster, 'improvement.' Thus the black walnut and cherry in many parts of the State have been split into rails or burned in log-heaps. Pines are cut down for a few bolts of shingles, or a single saw-log, and the balance left to rot. Oaks fit for the ribs of mighty navies are burned up to rid the ground of an encumbrance, and to-day the exquisitely beautiful 'birds-eye maple,' fit to adorn the palaces of kings, is burned as fire-wood, or thrown into the log-heap, an unconscious burnt offering to the god of folly. Instead of preserving in any proper measures these blessings of God's own planting, man seems to take delight in wasting his fair heritage, and as tree after tree falls beneath his blows, he exclaims, 'one enemy less in the land!' Thus fields and homes, highways and byways are smitten with one common treeless doom, and the dreary monotony of the desert threatens a land that was once like the Eden of old, where 'God made to grow every tree that is pleasant to the sight and good for food.' We have forgotten that the bountiful Father has declared that 'the tree of the field is man's life.' * * * But rich as we are in this treasure, when we see how rapidly we are parting with it, when we learn how vast is our market, that the Government buildings at Chattanooga and Nashville were built with pine lumber taken from Saginaw, when we see that the Chicago market has become the first lumber market in the world,

and all her treasure is drawn from our State, that every river and stream on our western border is made to pour this forest wealth into the Chicago market, to supply the comparatively treeless region which stretches to the foot of the Rocky Mountains, when we see these 'portable steam saw-mills,' like 'flying artillery,' sweeping over our State, at every cross-road, opening their guns upon the trees still left in the settled portion of the State, your committee think our people should ponder, and ask themselves whether they are not 'killing the goose that lays the golden egg.'"

The lack of timber for mechanical purposes is not by any means the greatest evil which results from the wholesale clearing away of our forests. It is a well established fact that the removal of large bodies of woodland has a decided effect upon the climate of a country; that the humidity of the atmosphere, the temperature, the moisture retained in the soil, the supply of water to springs and streams, are all unfavorably affected when too large a proportion of woodland is cleared.

If it is not demonstrated to a certainty that the annual rainfall is diminished by the removal of forests, it is apparent, from observations which have been made, that those portions of the country which have a high percentage of forest surfaces, are those which receive the greatest amount of rainfall. I presume each one of you can recall instances of streams in various parts of the country which, when the country was new, flowed with a copious supply of water in the dryest summer months, but which now are dry, or nearly so, a considerable portion of the year. I remember when a boy of having a small boat upon the Thread Creek, which flowed through the township of Burton, where I lived, and often in midsummer I have rode for several miles up and down that stream, where now a chip thrown in would hardly float over its shallows. Regions of country which are thickly timbered, or which have frequent clumps and masses of trees growing, are always better supplied with flowing springs and streams than are the open plains. The cause of this is, that the soil which is shaded by trees does not as rapidly evaporate the moisture which it contains as when the sun shines upon it, or when it is exposed to drying winds. The moisture thus remaining in the soil gradually and continuously percolates through the earth in thousands of little rills, till it comes to the surface in some spring, or finds its way into a stream, which is thus kept well supplied with water. This fact is also proved by the increase in the depths of wells made necessary by the receding of the water level from the surface of the ground. Gen. M. R. Patrick, formerly President of the New York State Agricultural Society, in an address made some years since, stated that statistics of the pump trade showed a gradual increase in the length of tubing required. In central Illinois this increase in the depth to water in wells had increased about nine feet within the last ten years. Frequent belts of timber also prevent the sudden melting of large bodies of snow, which so often causes terrible and destructive floods. The circumstance that snow remains latest in the woods in spring is a fact well known to you all. The temperature of a country is also largely affected by the depletion of its forest growth.

In the report of the State Board of Agriculture for 1865, T. T. Lyon, Esq., an experienced fruit grower and a careful observer of the effects of climatic changes on vegetation, says: "The natural result of this wholesale destruction of forests is manifesting itself in the higher winds, the more sudden changes and the more extreme cold of our winters; although in consequence of this state of affairs the peach, once almost as sure throughout our State as the

apple, is now in effect driven under the lee of Lake Michigan; and although even our staple grain crop, wheat, was but two years since almost a total failure from want of shelter and protection, and though we have reason to fear that we have not yet seen the worst, the process of destruction yet goes on unchecked and with a strange fatuity; although the subject is one that deeply concerns us all, no measures are being taken or even seriously contemplated to stay the growing calamity."

Any farmer who has had experience in the growing of wheat, has observed the difference in the crop, in those portions of his fields adjoining a piece of woods. Even a rail fence affords such protection from the winds, and so retains the snow for a covering, that the greenest and finest part of the field in the spring is the strip next the fence. As illustrating the marked effect of very slight shelter, I need only remind you of a fact that you all have doubtless observed, that wheat fields left in ridges running north and south yield better crops than if rolled smooth after seeding. The reason of this is found in the protection afforded from the cold southwest winds, and the shelter for the snow which these furrows afford.

The question then naturally suggests itself, how can the evils resulting from the unwise clearing up of the forests be further prevented and remedied?

I speak of the unwise clearing up of the forests, not because our farmers have shown any lack of wisdom in clearing off a portion of the forests, to fit the land for cultivation. This was of course necessary, for forest land yields no food to the human race. It is essential to man's enjoyment of the products of the earth that a portion of its surface should be cleared for their cultivation. But experience has shown that a certain proportion of woodland to cleared land should be maintained, and that the woodland should be properly distributed in order to insure the best results from farm culture. Those who originally cleared the land in this country, showed their lack of foresight in clearing off the entire front of their farms, and only leaving the timber standing in belts at the rear. This mode of clearing is particularly unfortunate upon farms fronting on east and west roads. It is common in this county, and becoming more so each year, for one to see miles of farming lands presenting a continuous stretch of open country, from east to west, without a tree to break the force of the prevailing westerly winds, which unimpeded by any protecting piece of timber, sweep cold and bitter over fields of grain and around unsheltered houses and barns. Had the early settlers left belts of timber of a few rods in width, standing along the west side of their farms, or what would have been better still, allowed a strip of trees to remain around the entire border of their lands, the gain in protection to their crops, and a more even temperature of the air, as well as the beautiful aspect thus imparted to the landscape, would far out-weigh any loss or inconvenience in working the land. A few years ago I visited a farm in Canada, which was thus entirely surrounded by a belt of trees about two rods in width, left when the land was first cleared, which to my mind was one of the most beautiful farms I have ever seen. The appearance of the rich fields of grass and grain, seen by the passer-by through the intervening trees, was not alone pleasing to the eye, but gave evidence of the beneficial effects of the protection thus afforded.

In order that the fertile and productive farms of Michigan shall not be rendered barren and unfruitful, through the combined influence of cold and drought, it is essential that a proper proportion of the woods now standing should be preserved, and that shelter-belts of timber should be planted and cultivated in those localities where the trees have been too much cut away.

It will of course be much easier for land-owners to preserve the timbers now standing than to supply its place by a new growth. The slow development of trees has always been a great obstacle to the general cultivation of them for purposes of screens and timber. And it is but natural for a people like the Americans, who live so wholly in the present and who take so little thought for the morrow, to hesitate and neglect to plant a crop for which they must wait years before they can reap the harvest. But with a little care and attention the woodlands now forming portions of our farms may be kept undiminished, and at the same time furnish the needed supplies of wood for fuel and for the usual farm purposes. In cutting for wood, only the dead and decaying trees should be taken first, allowing the thrifty, growing ones to stand. In a tract of forty or fifty acres of woodland this will afford an ample supply of fuel and some to spare, as a considerable number of trees in a forest are always more or less touched with decay, while their value for wood is scarcely impaired. The young trees which spring up in great profusion from the seed will soon attain a considerable size, if all grazing animals are shut out of the woods. Nothing works such injury to young trees as roving cattle or sheep, which eagerly browse the tender shoots; and I would advise each farmer who desires to raise a crop of forest trees to supply the place of those he is obliged to cut down, to exclude his animals from his woods as carefully as he does from his corn-field. The gain of a few acorns and beech-nuts for the pigs, or a little scattering pasture for the cattle, will be small in comparison to the value of the timber which a few years hence may be cut from the surplus of his forest growth.

Where but little clearing has been done, as is the case with some tracts of land still remaining in this vicinity, if the owner will consult his future interests, he will leave upon the south and west sides of his farm a belt of timber at least two rods in width, in which the underbrush shall be allowed to grow thickly, thus affording a good protection from the southwest winds. Observations taken at the Agricultural College for a series of years have determined the fact that by far the most frequent winds prevailing in the central portion of our State, and in cold weather the coldest and most bitter winds, blow from the southwest. There is greater necessity, therefore, for shelter and protection to fields from winds in this quarter than from any other point of the compass. If the timber has been largely cut from farms, as is the case in the more thickly settled and older portion of the State, it would be of great benefit and advantage to the farmer to plant a few rows of thick-growing trees along the south and west sides of his farm. A good selection of trees for this locality would be oak, ash, and maples for the center of the belt, with rows of Scotch and Austrian pine, or American arbor-vitæ, for the outside. The European larch, if it can be obtained, is a most desirable tree for this purpose. These trees, if planted in rows eight feet apart, and four feet apart in the rows, will in a surprisingly short time form a thick growth of considerable height, which will afford great protection to orchards and crops. Observations have shown that a screen of trees will protect one rod in width of land for every foot of its height.

As the trees increase in size they may be thinned out from time to time, and the poles thus cut utilized in many ways.

Trees thus planted in belts, grow much more rapidly than is generally supposed. In a paper written by C. S. Sargent, Director of the Botanic Garden and Arboretum of Harvard University, and printed in the report of the Massachusetts State Board of Agriculture for 1875, giving suggestions on tree plant-

ing, the writer quotes the following statement: "Isaac Pullen, a well known nursery-man at High Town, New Jersey, showed me last summer several belts of evergreen trees which had sprung up from his nursery rows to a height of twenty-five or thirty feet in ten years; and he stated that within the shelter of these screens his nursery trees *as well as farm crops* averaged fifty per cent. more than in blank or exposed places." Again in speaking of a plantation of trees upon the estate of Richard S. Fay, near Lynn, Massachusetts, he says: "I recently visited these plantations, twenty-nine years after their formation, and took occasion to measure several of the trees, but more especially the larches, some of these are over fifty feet in height and fifteen inches in diameter three feet from the ground, and the average of many trees examined is over forty feet in height and twelve inches in diameter. The broad-leaved trees have also made a most satisfactory growth, and many of them, on the margins of the plantations, are fully forty feet high. During the past ten years about 700 cords of fire-wood have been cut from these plantations, besides all the fencing required for a large estate. Fire-wood, fence posts and railroad sleepers, to the value of thousands of dollars, could be cut to-day, to the great advantage of the remaining trees." It will thus be seen that the farmer desirous of providing some protection for his buildings, orchards and crops, by planting timber belts around his fields, need not be discouraged by the thought that no benefit can accrue to him during his lifetime. Unless he be very near the sunset of life, his efforts in the direction of tree planting will be rewarded with a success which he may himself enjoy, or if death should come before the full realization of his hopes, will it not be a gratification to him to know that his children will enjoy the fruits of his labors? Although less attention has been paid in this country to the planting and cultivating of trees for timber to be used in manufacturing and building, than to the other branches I have touched upon, yet this branch of Arboriculture has already, especially on the prairie lands of the West and the old clearings in the Eastern States, assumed considerable proportions; and should, I am firmly convinced, receive still more attention from the people in this country.

When we consider the fact that it will require thirty years at least to grow a tree large enough to make a fair-sized saw-log, and the further fact that the present supply of wood for timber purposes in this State will, in all probability, be nearly if not quite exhausted thirty years hence, if no measures are taken for its preservation and replanting; when we consider these facts, I say, we may well ask ourselves, is it not our duty to make some provision towards replacing the timber growth which we have consumed? In other words, shall we, after having harvested one crop of trees, plant another to succeed it? This question may appear to be of little practical importance now, but just so surely as the farmer must sow his seed year after year to produce the crops of grain which furnish him with his food, just so surely must successive crops of trees be sown in order to supply the timber wants of the future. The growth of tracts of forest can hardly be expected to be carried on by individuals to any great extent, on account of the slow growth of the trees to maturity, but it is the province of the State, and the national government, to provide that the planting of trees shall be encouraged in every possible way. It would be well if some portions of the government lands, still unsold or those which are forfeited to the State for the non-payment of taxes, could be held by the State, and the timber on them carefully preserved: or if barren of timber, new trees should be planted, and cared for by the government in accordance with

the forestry policy of the various countries of Europe. Nearly every government in Europe makes provision for a system of management of national forests, and is engaged in the work of planting new tracts of timber where old ones have been cut away.

Regular codes of laws are in force, by which the woodland is protected from the depredations of timber thieves, and the products of the forests sold and the proceeds added to the revenues of the state. Some measures have been taken by our own government, making provision for the planting of forests in the Territories; and some of the States have passed laws to encourage tree planting, but as yet with but limited results. I have no doubt that the recommendation of Governor Bagley, appointing a tree planting day in the centennial year, was the means of inducing more people to plant trees, than all the tree laws which have ever been enacted in Michigan have been able to do.

In conclusion, let me urge upon you the necessity of studying carefully into this subject, which I have so imperfectly outlined to you. There has been much written upon it, and very much intelligent investigation has been made of the various questions connected with the cultivation of trees, the results of which have been embodied in reports which can easily be obtained for study. Let each one remember the advice of the dying Scotchman to his son: "Ye may be aye sticking in a tree, Jock; it'll be growin' when ye're sleepin'." A little time given now and then to your trees, will ere long furnish your fields with sheltering belts of timber for the protection of your crops, or will surround your home with beautiful trees, in whose shadow you may rest in the evening of life, and bless Him who made to grow "every tree of the field."

Prof. W. J. Beal gave a lecture on "Improvements in Fruits, Grains, and Vegetables." (See lectures given at more than one institute.)

This lecture and the discussion following occupied the remainder of the forenoon session.

AFTERNOON SESSION.

Vice President Rockford in the chair.

The following paper was read by James C. Wilson, M. D., manager of the Crapo farm, on

HEREFORDS *vs.* SHORTHORNS.

Gentlemen:

My appearing before you to-day in the capacity of an essayist on the breeding of cattle, is altogether a new *rôle* for me. Were I invited to write an essay on "physics," I might very naturally expect to interest some of my audience, who possibly may have suffered from practical experiments of mine in that direction. But when I come to talk with farmers about raising stock, and venture an opinion, as to the *best* and most *profitable* breed for them to have, I feel that I am dealing with quite a different subject than that of "calomel," "blue-mass," or "jalap."

Yet having had a good deal to do with the direction and management of the "Crapo farm," in the township of Gaines, in this county, for the last twelve

years, and as we use it principally as a stock farm, I am not without some personal experience on the subject which I propose to discuss.

The farm which I allude to is known to most of you, and was originally a marsh covered with water. Besides the moor land, or "grand pra" of seven or eight hundred acres, it is skirted on either side by uplands, which give an extent of 1,240 acres as its present area.

The soil of the marsh is a rich black mould, of vegetable deposit, and since its thorough drainage produces fine pasturage, and good crops of hay, corn, and roots. The uplands, most of which are cultivated, are composed of clay and gravelly loam, and are good for any kind of crops.

Since the year 1866, we have grazed and fed annually from 150 to 250 head of cattle, composed of three noted and distinct breeds, the Herefords, Shorthorns, and Devons, together with grades and natives.

In that year, the late Gov. Crapo, seeing a necessity of improving the stock he had been carrying on his farm for four years previous, made selections from the herds of celebrated breeders of Shorthorns, Devon, and Hereford cattle, for the purpose of testing their relative merits, and also the grades produced by crossing with native heifers.

His Short horn bull Lucifer and cow Lucern were purchased of Mr. Cornell, of Ithica, N. Y., and were both prize animals in their classes, as calves, yearlings, and two years old, at the New York State fair, before Mr. Crapo purchased them. His Devon cow, Lady Elgin, was bred by Mr. Cole, of Genoa, N. Y., and was also a prize animal; and his bull Wabaness was bred at the Agricultural College farm of this State. They were both superior animals of their breed, and the bull was of more than average size and weight for a Devon, and a good stock-getter. The Herefords were from the herd of F. W. Stone, of Canada, and were composed of a bull, "Velvet Jacket," two years old, and three heifers of the same age.

The knowledge he wished to obtain (as he told me at the time) was, "Which of the three breeds was best adapted to our soil and climate, and would, upon crossing with our natives, produce the largest amount of beef, in the shortest time, with the least amount of food and care."

In order that the experiment might be fair and impartial, the three breeds were treated alike as to food and shelter. The grades, although receiving different treatment from the "pure bloods," were the same, as to each other, grazing on the same pastures in summer, and feeding at the same racks and cribs in winter.

The first year sixty native heifers were procured and served, twenty going to each bull, and this is about the number of calves we have raised annually since that time. The calves, both pure bloods and grades, were allowed to run with their dams until fall, when they were taken off and put by themselves, and weaned on aftermath. We wintered them on hay, with the addition of a little meal to the pure bloods, both being protected from storms by sheds and stables, and received their food from racks and mangers in these covered sheds.

The second year they went to grass in the spring in good condition, and fared the same during the summer.

The following winter they got coarser fodder, such as corn-stalks, straw and hay, but neither roots, nor meal, nor grain of any kind, being protected, however, by sheds as before.

The third summer they again run to pasture, and if not marketed in the fall, the steers are stabled and stall-fed on roots, meal, and hay, and sold at all

times when ready for the market,—some at Christmas, others in February and March, and still other lots in June and July.

Fed and cared for in this way, our grade Hereford steers weigh from fourteen to sixteen hundred pounds live weight at three years old, and dress from sixty-two to sixty-five pounds to cwt. live weight. Our Shorthorn and Devon grades never reached this average of our Herefords, and our herdsmen say they would rather keep "three Herefords than two Shorthorns" in the stalls in winter, or on pasture in summer.

Our Hereford steers are always fat and ready for the meat-block. The Devons come nearer to the Herefords in this respect than the Shorthorns; but they are much smaller at the same age, and thus less profitable to the farmer.

The experiment inaugurated by the Governor was continued during the three years of his lifetime by himself and by his son, the Hon. Wm. W. Crapo, of New Bedford, Mass., for four or five years subsequently. The result was to satisfy him, and has been to satisfy us also, that the Hereford breed of cattle for farmers in general in this climate is more profitable, all things considered, than any other with which we are acquainted.

Do you ask me to explain why? I answer: because they mature earlier, are more hardy and less liable to disease, are better feeders and grazers, fatten on less food in their stalls, and keep in flesh at all seasons of the year; and when killed produce more dressed beef to the cwt., live weight, and alive or dressed command a more ready sale, where the qualities of their meat are known, than any other cattle in the world.

This is "putting it strongly," you will say; but we have proved it beyond cavil, on a scale large enough and continuing through a series of years long enough, to satisfy any unprejudiced mind.

At the beginning we were not prepossessed in favor of the Herefords. Our foreman and herdsman on the farm were both Shorthorn admirers, and did not take gracefully at first to the white faces. The Shorthorns were then the fashionable breed. We had a ready sale at large and remunerative prices for our pure blood Shorthorn calves, and also for our Devons, while our Herefords went begging for purchasers at merely nominal prices. It was not, then, because of their greater popularity among breeders and farmers in this State, or in this country, that caused us to adopt the Herefords on our farm. It was simply and purely on their merit. They have worked themselves up against all opposition from every quarter, until to-day they stand unrivaled in popularity by any breed in this country.

Whence this change? Why is it that our Shorthorn bull dropped July 30th, 1877; thoroughbred, good pedigree, good animal, stands in his stall to-day at the nominal price of $50, while our Herefords are all sold at three times that figure; and they were sold at about one-half the price realized by other breeders? Why is it that our Shorthorn heifers and cows stand in their stalls unsold at prices less than we are offered for our grade Hereford heifers and cows? Why is it that I have sold eighteen Hereford grade bull calves to Mr. Powell, of Beecher, Mill county, Ill., for $900, or an average of $50 each, while I cannot sell a pure blooded Shorthorn one year older than some of those grades for $50? Is this experience of ours an exceptional one? Not at all.

In the Journal of Agriculture and Farmer, published at St. Louis, Mo., of December 28th, is a letter from T. L. Miller, of Illinois, in which he says, "Parties wishing to improve their stock are buying thoroughbred Hereford bulls at prices three or four times as high as Shorthorn bulls can be bought

for, and buying grade Hereford bulls from common cows, at prices beyond what they can purchase thoroughbred Shorthorn bulls for, and still the supply of thoroughbred or grade bulls is very much short of demand, and the supply for the next season is nearly exhausted." "I have sold for next season's use already some sixty bulls. To one man, fifty for $11,000." In May last he sold to the Messrs. Swan, of Colorado, forty young bulls, for immediate use, for $10,000.

The Editor of this paper asks the question that I am asking: Why is it, "that while Shorthorn bulls can be bought at from $100 to $150 (and you see he can split those figures on ours, and call it $50 and $75), of the most reputable breeders, men whose experience dates back fifty years, and whose boast respecting their stock and its value is not the growth of a day, but a century; why, then, should men pay from three to four times these prices for a breed untried and comparatively unknown?"

This question is being asked not alone by the Editor of this Journal, but by Shorthorn men throughout the whole country, here in Michigan as well as in Illinois, Iowa, Kentucky, Ohio and Indiana. I have answered it already. It is because of their merits. But a more extensive review of their past history, and their standing in the country where they originated, as well as in those countries to which they have been imported, including our own, may aid us in shedding some light on this important question now agitating the minds of breeders, and feeders, and grazers of cattle all over this broad land.

"Untried and unknown," says the editor of the Journal.

Is it so? Is it not a matter of record that at the first show for fat cattle of the Smithfield Club, held in England in 1799, that the winner of the first prize was a Hereford ox fed by a Mr. Westcar? And in Bell's *Weekly Messenger* for May, 1857, you will find it recorded that this same feeder of Hereford cattle took the first prize with a Hereford ox for twenty years in succession, from 1799 until 1819, at the London Cattle Show, which was open to all breeds in the Kingdom. In this same letter we are told that a Mr. Potter sold to Mr. Westcar fifty Hereford oxen, in Christmas Cattle Market, that averaged fifty guineas each; and Mr. Duckham gives a list of twenty, sold by Mr. Westcar from 1799 to 1811, that averaged £106 6s. each, about $531 of our money. In the year 1825 a challenge by the Duke of Bedford, who was a breeder of Herefords, to show three of his steers against any three Durhams in the Kingdom, was accepted by Sir Chas. Arbuthnot, a celebrated Shorthorn breeder, and was won by the Herefords. Many such challenges are reported; but I need only add that from the establishment of the Smithfield Club, in 1799, till 1851, the Herefords took 185 prizes, while the Shorthorns took 82, the Devons 44, the Scotch 43, the Sussex 9, Long Horns 4 and Cross Breeds 8, thus giving to all other breeds combined only five more prizes, in fifty years, than those awarded to the Herefords alone. As to the quality of the beef in those years, I quote what Mr. Guenier said in 1840:

"I take this opportunity to state that during twenty years' experience as a salesman of cattle of all breeds in the Smithfield market, where I have sold from 5,000 to 10,000 cattle per annum, I could not persuade my best West-End customers to purchase Durhams, when I had well-bred Herefords; they one and all said they found more roasting, as compared with boiling, in the Herefords. Last Christmas I had Durhams fifteen stone per ox heavier than Hereford, but I could not realize so much, by four pence per stone of eight lbs., as for the Herefords. I never found any breed of cattle more profitable than

well-bred Herefords." To this Mr. Miller, of Illinois, in a communication to the Journal, adds: "This testimony, given thirty-eight years ago, has been made complete up to June, 1878;" and it is alike favorable to the Herefords. Mr. Miller has kindly furnished me with extracts from a letter received by him from a Mr. Price, of Australia, dated August, 1877. He says:

"I live sixty miles from Adelaide, where our stock fairs are held, and have to travel my stock that distance. I have taken the lion's share of prizes when I have shown. For three years I have taken the champion prize over Shorthorns. I have sold twenty bulls within three or four years. I have just sent one to West Australia, 1,500 miles by sea. I sold three, three years ago, to one of the large squatters. They turned out so well that he wanted six more last year, and he is well pleased with them."

"But I must tell you something about the beef, for, after all, that is what we breed for. I have been in the habit of selling my steers at two years and six months. Last year I sold them at £14. This year I sold them at £15—much above the price of any Shorthorn sales; in fact, very few Shorthorns go to market here under five or six years old, and then seldom make that price, except picked lots—and *I* keep my *best* for bulls. The year before last I kept a part of my steers over. They brought at three years old a fraction under £32 each."

"New South Wales is, however, the place for Herefords. I have acted there as judge for the last two years. The year before last there was shown at Sidney the best lot of yearling heifers I ever saw together. I wrote Mr. Duckham that if Herefordshire had been over here, it could not have produced eight such heifers as I had to award on. The year before last twenty-one yearling bulls were shown, and all good ones. The first prize bull was one year and three days old, and sold to a Victoria cattle man for 500 guineas. The same man bought one of the heifers for 300 guineas, two for 250 guineas each, and two for 150 guineas each, making in all about 1,150 guineas—about $5,750—for five yearlings, and offered 700 guineas for a seven-months-old calf, which the owner refused." "With the exception of the bulls, my cattle never get anything but what they get off the run or range." "For six months they have nothing but roast meat—not a living blade of grass all through the summer. And yet, they are always fit for the butcher, even when suckling calves."

"As I could not get Herefords when I commenced cattle breeding, I got Shorthorns, intending to keep both breeds, but I found they lost so much flesh when suckling their calves, (they would not take the bull for six months after calving), that I sold them all out, and went wholly into my favorite white-faces, in which I intend to continue to the end; which, by the course of years, cannot be long, as I am now seventy-two years old.

(Signed) C. PRICE."

From Jamaica, Mr. Edwards, of Knockalva, writes; "We have Herefords which I have rarely, if ever, seen beaten at any agricultural show in England. As regards their aptitude to fatten, there is no stock in this country to compare with them, and for early maturity they stand unrivalled. All our cattle are grass fed, and receive no artificial food."

"Our three-year-old steers weigh from 700 to 800 pounds, carcass weight. temperature in summer stands 90° in the shade, and in winter I have never known it lower than 57°."

From Scotland we have the same general testimony. Mr. Lumsden, of Aberdeen, writes: "I have been a breeder of Herefords for twenty-five years, and

continue to do so, as I find they pay better for their keep than any other breed; or, at any rate, than those I have tried against them, viz.: Shorthorns and Aberdeens."

"They are hardier and stand this northern climate better than any Shorthorns I can find, all of which prove delicate, and many of them die. The Herefords can be brought to the highest condition with grass and turnips, while the others require oil cake or grain, or both."

From Ireland, Mr. Gilliland, of Londonderry, writes: "I consider the Herefords the best class of stock I can keep for the butcher."

"They are much hardier than the Shorthorns, and more easily fattened than either the Shorthorns, Ayrshire or Irish. I have crossed them with the two last breeds to much advantage, particularly the Irish, which are greatly improved in their fattening qualities by the cross. I have had several weigh over twenty cwt. gross under three years old."

From Canada, Mr. F. W. Stone, of Guelph, writes: "I am an extensive breeder of Shorthorns, of which breed I think very highly; yet I trust I shall answer your inquiries without prejudice."

"I believe them preferable to other breeds as grazers. Those I have, seem at all times fit for the butcher, and I think they will prove most profitable for the Western prairies. I have had no experience in stall feeding, but during our long winters they seem to surpass others in condition, and I think them as hardy as any other breed, and very suitable animals for this climate."

The foregoing from Mr. Stone was written in 1866. Since then it would seem he has had experience in stall feeding, and the relative merits and advantages of the Herefords as compared with the Shorthorns.

In a letter received from T. L. Miller, of Illinois, of December 30th, 1878, he says, in answer to my questions on this point:

"The Herefords can be kept on less feed, and make greater gain than any other breed, and when made will bring more money."

Mr. F. W. Stone, of Canada, and G. S. Burleigh, of Iowa, who have bred Herefords and Shorthorns for many years, place the difference as three to two, *i. e.*, that they can keep three Herefords on the same keep as two Shorthorns. He adds:

The London market quotations show higher prices for Hereford than for Shorthorn beef. To-day and for a year past, at the Union stock yards, Kansas City, and St. Louis, they are recognized as the leading steer; and the Herefords as the coming beef cattle."

"I have grazed and fed Shorthorn and Hereford grades together, and the Herefords were better at two than the Shorthorns at three, and at three than the Shorthorns at four."

"Of the Herefords shown by me, at the late fat cattle show held at Chicago, a seven years old ox dressed nearly seventy per cent of beef to the gross weight. A seven years old cow dressed seventy pounds. A three years old cow dressed sixty-eight pounds. The seven years old ox, or seven years old cow, were not high fed, and the three years old had not been off the pasture five months. I fed a pair of three years old, and a pair of two years old grade Herefords from June 1st to December 1st, making a gain on the three years old of 1,000 pounds, and on the two years old of 1,200 pounds."

"I have sold in the last five years mostly to the plains and Texas, over 400 head, mostly bulls, at prices ranging from $200 to $500, and in some cases at higher figures. My annual sales of this breed of cattle average considerably over $30,000."

"It is conceded by all cattle men on the plains, that have bred from Short-horn and Hereford bulls, that the Hereford bulls are the best. And feeders in the States, who have fed grade Herefords from the plains, say that they never fed anything at so much profit; and our man says he will never feed anything else, if he can get Herefords; and when grade Herefords come on the Chicago market, they command from 1 to 1¼ c. per lb. higher figures than the balance of the lot."

"The Messrs. Swann Brothers, to whom I have sold so many bulls, say they produce the best western cattle they ever saw; and as workers (oxen) they have never seen their equal."

"I have now been breeding Herefords for seven years, and I have been more fully convinced each year that they were to make the greatest success ever made by any breed of cattle in this or any other country. I have been obliged to work against a very strong Shorthorn influence. The State and county agricultural societies discriminating against me, both in classification and judging."

"But the merits of the cattle have carried them to the front. Of this there is no doubt, and they have now such a position that they will command fair treatment everywhere."

"They are equal to any other breed as a general purpose cow. Their milk is always rich, and as a butter cow they rank high."

"Edwin Phelps, of Pontiac, in this State, writes me: "I commenced breeding Herefords in 1864, from the herd of Erastus Corning, Albany, N. Y."

"My reasons for adopting this breed, were their evident hardihood and ability to bear ordinary or even poor treatment, and yet retain their good qualities and valuable meat."

"As Sanford Howard expressed it, after extended travel and careful comparison of the improved breeds of cattle, he unhesitatingly pronounced the Herefords peculiarly the poor man's cattle, thriving better under ordinary care than any other breed."

"I have abundant illustrations of this in my short experience."

"I have fed Short-horns and Hereford grades for beef, having an equal chance from first to last, and the Herefords outsold the Shorthorns a penny per lb. in New York market, their weight being about equal."

"I find the Hereford grades, like Suffolk pigs, ready for market at any age, while the Short-horns do not fit well until three years or over. I have lately been buying some stockers of my neighbors, and they universally hold half blood Herefords at from \$5 to \$15 per head higher than half blood Short-horns."

"I have milked the cows more or less ever since I have had them, and find them only fair milkers (as to quantity) but giving milk rich in cream, of which butter of superior quality and good quantity can be made."

You are aware that I have sold myself short on several occasions, and notably this fall; the demand being urgent and money so tempting, I let more go than I ought, viz.:

3 Bull Calves, at	$125 00 each,	$375 00
1 Heifer Calf, at	125 00	125 00
1 Yearling Heifer, at	150 00	150 00
2 Two Years Old, at	175 00 each,	350 00
1 Cow, over 5 years old, at	150 00	150 00
4 Calves, 1 yearling, 2 two years old, and a Cow		$1,150 00

"I have had calls for very many more than I could spare, and at much higher prices than the sales I made. While a friend of mine, a celebrated Shorthorn breeder, tells me he has not sold a calf this fall, although he has offered first-class animals from the most fashionable families at $50 each."

Mr. Wm. Hamilton of our own city, another Shorthorn breeder, I see by Mr. Sotham's letter in *Globe,* is about changing to Herefords, and advertises a number of Shorthorn bull calves for sale very low.

Mr. Thomas Foster, who has long been a breeder of Devons, and whose herd, at our county fairs for years back, has been so much admired, becoming satisfied of the superiority of the Herefords over all other breeds, has commenced breeding them, and has already a herd of six or eight pure bloods. He says the Hereford grade steers are as good at three years as any other breed he knows of at four.

The same testimony comes to me from Indiana, from a Mr. Seabury, a breeder of Shorthorns and Herefords. He lives at New Bedford, Mass.

Mr. Crapo writes me January 7th, 1879: "I have not been able to see Mr. Seabury on account of his absence. I regret this, for while he cannot add much to your knowledge of the Herefords, he would have expressed his unqualified preference for them over the Shorthorns. His first purchase was a bull calf from me. This yielded him such admirable grade steers, that he has since purchased quite a herd of pure bloods. His pure blood bull calves sell readily at $300.00, when taken from the cows."

Returning to our own experience, let me give you some facts on these points, and you will see how nearly they agree with those of other breeders.

I have sold thousands of dollars worth of those fat cattle to Mr. Kline, and they have been slaughtered and the meat sold by him in this city. He says, "They are the best cattle I ever handled. They will dress more meat to the gross, live weight, than any Shorthorns I ever killed."

I sold Mr. Kline a three years old Hereford steer in 1875, stall-fed, pure blood, live weight 1,900 lbs., that dressed 69 lbs. to the cwt., after being frozen and hanging in his shop over two weeks.

At Christmas, 1876, I sold him two Hereford cows, seven and eight years old. Taken from the grass October 20th, and put in stalls. Live weight at Christmas, 1,576 and 1,625, and dressed 70 lbs. to the 100, live weight.

At the same time I sold him a thoroughbred Shorthorn cow, fed in kind, like the Herefords, but in quantity, our man said, as much as the other two. Live weight 1,789, but dressed only 56 lbs. to the 100.

In June, 1877, I sold him twenty-five head of Hereford grade steers, that had never been stabled. Wintered on hay, fed one pint of corn meal dry, twice per day to each steer, from March 1st. They averaged nearly 1,500 lbs. each, live weight, and dressed from 62 lbs. to 65 lbs. to the 100.

Mr. Kline generally pays me from one to two cents per lb. more for our grade Herefords, than for the ordinary fat cattle he buys of the farmers in this county.

Mr. Daily, a cattle drover of Detroit, to whom I have made large sales, says they surpass any other cattle he ever handled, in the qualities of their meat, and small amount of offal, compared with live weight.

I am often asked "how are they for milk and butter, as a general purpose cow?" We have never kept a dairy, but we milk the grade cows in the fall for six or eight weeks after weaning their calves.

Mrs. Benham, who attends to the milk and making of butter, says she never

saw richer milk from any cows. That it makes superior butter, we know, but possibly the Herefords ought to divide at least half the credit of this with Mrs. Benham. Mr. Crapo, who has his butter sent him from the farm, speaks in the highest praise of it.

We have no statistics to show you just how much milk they will give per day, or how much butter it will yield per quart, etc.

We know they raise large, fat, splendid-looking calves, which argues good nursing. Sometimes we bring up two calves on one cow, and they seem to thrive and do well. Our foreman has the use of two cows, as one of the perquisites of his place, and I notice he generally prefers the grade Herefords.

I have had one at my house, here in the city, for two years. This fall we had occasion to change for a grade Shorthorn, that just "came in." I find neither our own family, nor the milk customers, who came to get choice milk, because we had more than we could use, I say neither like the change, and say the Hereford's milk was much the richer of the two.

But these are only isolated cases, and I do not put them forth as proving that the Herefords equal, or surpass other breeds, for dairy purposes.

Every man of any experience in the principle of development of qualities, know that to develop milking qualities in cows, the calves must be taken from them when dropped, and the cow be put to the pail. And I will go still farther, and say, that to raise them to the highest standard, you must commence with the primipara, and continue for generations in this way, selecting always a sire belonging to a good milking family, and feeding well, keeping your animals in good flesh, and in this way it only requires a little time to make good milkers in any breed of cattle.

Your improved Shorthorns of to-day are not as good milkers as the earlier produce, for this reason: in seeking to improve the breed, that care in selection, which was necessary to make them a superior meat-producing breed, ignored or paid but little attention to the milk-producing qualities.

By the adoption of this principle, that "like produces like," the Hereford breed has been brought to that perfection in the development of meat-producing qualities, that they stand *peerless* to-day among all other breeds of cattle.

This same principle is recognized in the breeding of horses for speed or draught. The exercise and training that develops speed, carry with them the potency and power (evolved in the animal), to produce it in the offspring.

The pigeon fancier takes advantage of this principle in breeding and producing those marvelous varieties of those beautiful birds, known as the pouters and tumblers, the fan-tails and carriers, etc., etc.

In the same way we have produced among dogs the setter and pointer, the spaniel and terrier, the shepherd, etc.

I need not enumerate examples farther. It would take too long, and exhaust your patience, and the time allotted to me, were I to dwell on the effect of climate, soil, food, care, treatment, etc., as factors in producing those changes. But if you will only consider that it is seriously and ably advocated by the renowned Darwin, that man himself is nothing more than a transformed monkey, you will see what great possibilities are before you in the breeding of cattle.

If you will only observe the laws of natural and scientific selection, you can produce from the Herefords as good milkers (if they are not such now), as any breed in the world.

Fortunately I am able to present you with some facts corroborative of this position, from some dairy districts in England, where the Herefords have been used for dairy purposes for a long time.

Mr. Read, of Elkstone, writes: "They have been used for more than half a century on this farm, and I believe they yield a larger return than could be obtained from any other breed on a similar class of land." He adds: "We rear our calves by hand after a few days old."

Mr. Bennett, of North Gerny, writes confirming Mr. Read's opinion, and adds "that during his thirty years' experience he has tried cross-bred (Herefords and Shorthorns), but that he did not find them as valuable as the pure bred."

Mr. Nappowder, of Blandford, writes: "Our herd of Herefords have been established for forty years, and so far from having degenerated with us, they have much improved, and Hereford dairies are becoming very common in this county."

"In proof that they are good for milk with us, we let one hundred cows to dairy people, and if I buy one of any other breed to fill up the dairy, they always grumble, and would rather have one of our own bred heifers."

From Cornwall Mr. Lobb writes: "For the first fifteen years of my farming I kept North Devons; for the past twenty-seven, Herefords." After detailing much about their merits, as compared with the Devons, he adds: "Hereford cows are generally said to be bad milkers. That is contrary to my experience, and I feel persuaded, when such is the case, it does not arise from any constitutional defect, but rather from mismanagement in raising or a deficiency in the constituents of their food, essential to the production of milk."

"My cow 'Patience' has this summer given 14 lbs. of butter per week, and 'Blossom' gave 22 quarts of milk, yielding 2½ lbs. of butter per day."

Mr. Gilliland, of Londonderry, Ireland, to whom I have already referred in regard to their aptitude to fatten, says about their milking qualities:

"I have not used them much in the dairy, but whenever I have, the milk has been found to be very superior in quality."

His farm agent says: "I do not dairy except for private use, but I have found that eight quarts of Hereford's milk are equal to twelve of Ayrshire or Irish."

The question very naturally arises here, why, if the Herefords are the superior breed you claim them to be, and have been so long and so well known, and so popular in England and other countries—why they have not been more generally adopted in this?

How comes it that the *Shorthorns* have hitherto been most the popular cattle with feeders and breeders in this country? The admirers of this breed are practical men, men of sense, and men, too, who are after the profits to be made in raising and feeding stock, and why is it that your Herefords have not been more generally adopted among farmers?

To answer these questions, which are legitimate and fair, would require a more detailed history of the early introduction of the two breeds into this country, and also the circumstances attending the show made by traveling the Shorthorn steer and heifer, bred by the brothers Charles and Robert Colling, all over England, from 1801 to 1807. Into this I will not now enter. It is one of the enigmas I will leave you to wrestle with. In the *National Live Stock Journal*, of Chicago, for December, you will find much light let in on this subject, from the luminous pen of T. L. Miller, of that State.

But I may say it is not so much a question between the relative merits of Short Horns and Herefords among the majority of farmers of this county, and I believe, of this State, as it is between raising native "scallawags," or improved cattle of some breed.

I have bought about 100 head of one and two years old steers this fall and winter. Seventy-five are already delivered on the farm, and the balance will be this week.

As compared with the grade Herefords we have of the same age, they are very inferior. About one-third of those delivered are yearlings, and cost on an average $15 each The other fifty, in which there are six or eight three years old steers, the balance being two years old, average about $20 each. The commission to those who picked them up (Messrs. Packard and Davie, of Flushing), comes out of the farmers. I paid them 2½ cts. per lb., live weight, shrunk and weighed at the farm. If you have examined the quotations of the Detroit market, you have seen that the great bulk of the two-year old steers sold there for beef, do not average more than 850 to 900 lbs. live weight, and have sold at from 2 to 2¼ and 2½ cts. per lb.

We have grade Herefords of this age, for which I have refused $35 a head, for beef. They have had no extra care, and no extra feed since calved. I think were I to offer them to-day, to the butchers, at $40 a head, I could get it.

I bought of Mr. Daily (cattle drover), of Detroit, a few years ago, a lot of two-year old steers he had picked up among the farmers of Gaines, Clayton, and Flushing, and driven to our farm at $23 a head, and sold him fifteen or twenty of our Hereford grades of same age, at the same time, at $55 each. They had never been stabled or fed anything extra from calves.

I refused, this fall, from a Hereford breeder of cattle, $50 apiece for thirteen heifer grades that will not be two years old until next spring, and have been offered $75 for some of our two-year old grades. These were wanted for breeding, and not for beef. And of sales of pure bloods, I made to one man from Colorado a sale of three yearling heifers and a bull calf, for $600, and to another from same State, a two-year-old heifer and two calves six weeks old, for $325.

I mention these facts to show farmers what we are doing, and what they can do if they will only turn their attention to the improvement of their stock.

If you find you can do it as well or better with Shorthorns than with Herefords, I will not quarrel with you, but say go ahead, there is room for all.

My object is to awaken an interest among farmers generally, in the improvement of their stock, and to point out the advantages that will accrue to them by breeding from pure-blooded sires, of some improved breed, instead of from mongrels, as is now very generally the case.

If you live near a cheese factory, and are interested in the profits of it, use the Ayrshires, as their milk excels all others in the production of cheese. If you live near a city, and sell your milk, caring little for the quality, so long as you have plenty of it, the Ayrshires are your best breed.

But if you are not specially interested in these, and have only the general products of your farm, stock included, for your profits, try the Herefords. They will please you, and give greater return for the investment, than any other breed with which I am acquainted.

DISCUSSION.

Dr. Miles.—I think the Herefords deserve all the praise that Dr. Wilson has given them. They have no doubt been too much overlooked and undervalued in the past.

There are, however, differences among them as among the Shorthorns, and I know that those on the Crapo Farm are of the very highest excellence. The same breed of cattle we not unfrequently find kept in one locality for dairy purposes, and in some other locality for beef, and in the latter case they are sometimes bred so exclusively for beef that the cows do not give milk enough to feed their calves.

The doctor spoke of some grade Shorthorns, recently sold in Lansing, that he thought would perhaps make as good a showing as Dr. Wilson had claimed for any of his grade Herefords.

He believed that, when extra good care was taken of both breeds, he was rather inclined to think that the Shorthorns might make the most beef at two or three years old, but if no extra care were given to either, he had no doubt but that the Herefords would pay the best.

Mr. Davies.—Are the Herefords good for working oxen?

Dr. Wilson.—The Swan Bros., of Colorado, had large experience with Shorthorns and other breeds for working oxen, and they preferred the Herefords to all others.

The doctor instanced a number of cases in which the Herefords had taken the sweepstakes premium, over herds of Shorthorns, and urged upon the farmers the importance of improving their cattle, in view of the European meat trade, in which only improved cattle would be called for.

Mr. Slack said we have mostly small farms. We need to keep cattle for general purposes, and have dairy and beef qualities in the same breed. He found the grades the best for general purposes.

Mr. Montague said it should be remembered that farmers generally did not treat their calves as well as those raised on the Crapo farm. They had to make their milk into butter, and after a few days the calf was taken from the cow and fed on skim-milk. He thought that if they were allowed to run with the cows all summer, they might make almost as good a showing as some of the improved breeds.

Mr. D. P. Dewey, of Grand Blanc, read the following essay on

SHEEP HUSBANDRY AND ITS RELATION TO FARMING.

It almost seems out of place that one of so short a life experience, and especially in this particular branch of business, should be chosen to give any useful information thereon. But when you consider that I have already gained the reputation of knowing little else, it is not so much a thing of wonderment.

Sheep have been considered as profitable animals to handle or husband from time immemorial. The ancients had their flocks, and they were kept as they now are, for a twofold purpose—that of food as well as clothing. But without entering into any elaborate history of their success wherever introduced, I will endeavor to make a few remarks as to their present uses, and how the average farmer may keep them to the best advantage.

I will first give the form which all should strive to attain in their flocks, and with the general outline of a model sheep in their minds, they can the more readily cull from the one end while they breed on to the other, which process

will soon enable them to have a flock which will produce annually much value in wool and mutton. It is a noticeable fact that the average farmer pays too little attention to the form of his sheep, which is an essential element in keeping either for wool or mutton. How many farmers of Genesee county, I ask, stopped on entering their yards this morning, to cast around them for the defects of carcass which plain are to be seen in every flock, and I think far more so than among their cattle or horses, and the only reason I can ascribe for this is that they are more in numbers and smaller, and it therefore becomes more difficult to individualize.

The first thing to be regarded in a sheep is its form. It should be of good size, wide between the eyes, a strong nose with good nostrils, short neck, heavy shoulder, and should rise well from the back, carry well forward to neck and head, rather than drop; the shoulder should grow wider as it nears the ground, so that forelegs stand wide apart and straight, not bowing toward each other at the knee, a well rounded rib and a broad loin. How many fail in these three points, and they are of vital importance. The wide breast to give room for strong lungs, the round rib to give place to the digestive organs and fat upon the kidneys, without which the animal is unable to bridge over the long droughts of summer and the sudden changes of winter. The fine wool sheep had been bred for many years previous to its introduction into this country. with special reference to laying fat upon the kidney in times of abundance of feed, to be used in times of scanty herbage. This is not so of the Downs and mutton sheep generally. They have been bred by skillful hands to lay fat upon the outside, to meet the demands for choice mutton. Many of us not familiar with the especial purposes the different kinds have been bred for, charge our failure with this kind or that to the particular breed, while we should charge it principally to our own ignorance. The broad loin next, extending well forward, gives the animal what is termed a strong back. The hind quarters should be as heavy as is consistent with the general make of the animal, the ham full and rounded, hind legs well apart, the farther the better. They should be very nearly straight from the buttox down to the ground; the legs should be short and strong. I know so little of the long and middle wooled breeds, that I will confine my remarks to the fine wool grades and full bloods. I apprehend, however, that the above description will not be amiss for the other classes. As for wrinkles or folds, I will say but little. They are used to thicken the fleece, and are not as generally used by the wool grower as they should be, although of late their more general adoption signifies their value.

All who read the proceedings of our meeting of breeders and wool growers last month at Marshal, have seen this point fully discussed. After the form comes the fleece, and I think in this very few have taken pains to acquaint themselves with what they really want, or what the manufacturers require of them; but many join the cry for long white wool, and some of the buyers who are no more judges of wool than the average wool-grower, aided this cry. Of course I do not refer to any of the good citizens of Flint. I have in my possession letters from manufacturers, agents of Long & Albany, which prove satisfactorily to me that the wool from our high bred Merinos, wrinkly ones at that, are as yet worth the most to them where the breeder has paid sufficient attention to the quality of their fleeces, and by this I mean those fleeces which open brilliant on the sheep, and freely crack or cut in leaves without being pulled and picked apart, leaving those little fibers running criss-cross, so to speak, which denotes harshness of fleece. It should show a well defined crimp, run-

ning from roots to point. Each wool hair is hollow the whole length, and covered with little jagged points, and on the number and sharpness of these points depend its felting properties. In the harsh fleece less of them are found over its surface, and those found on it are more blunt.

Mr. Youatt discovered that in a fine fleece there are some 2,560 of these little barbs in the space of one inch. These little barbs give it the property of being spun into a thread of great strength, while the harsh one will not so readily knit together. The quickest way to become familiar with this difference is by examining and comparing the two with a magnifying glass. I well remember the time when the idea of the greatest amount of wool to the smallest carcass took possession of the minds of our flock masters, and the consequence was almost ruin to the best flocks of the State. And the malady was not alone confined to the limits of this State. It swept all over the land; and I fear now that the cry for long white wool will dispossess us of much value that we have well fixed in many of our flocks. It takes time for these changes; but let public opinion continue to cry for it, and we must yield to its demand more or less, even though we are fully aware it means degeneracy. But thanks to those who have passed through the mill, so to speak, for coming to our relief with their counsel to go carefully in this direction. Now, it is a fact well known to breeders, that a ram of this class has not been heard of as making any decided improvement, except he be bred from a shorter and thicker fleeced ancestor. A fleece may be three or four inches in length, and yet be of less value than one two and a-half inches possessing a crimp which is capable of being drawn out to a much longer and stronger thread than the long one. Pay a little more attention to the quality of your fleeces and confine yourselves to a medium length, and you will meet with greater success in the end.

Color of fleece is of small importance compared with many other points, for the white one may possess, and generally does, as much oil as any other, unless you get one of the buttery yellow.

The Spaniards bred for a buff tinge, and that was also Hammond's favorite color, a man who has no doubt given the subject as much thought as any breeder in America, and that is the opinion of the most successful breeders of to-day. The color of a ram's fleece should differ from that of a ewe, as nature has so fixed it. That of a ram should be more highly colored to buff, and this appearance is given by the more hardened oil of a ram's fleece. That of a ewe should possess more fluid oil, and consequently will appear more white. The skin should be loose on their bodies, capable of being moved around over their back and side; color of skin pinkish, though this should not be so highly colored in a ram as in a ewe.

The relation of sheep to good farming is everywhere noticeable. Their mission for clearing land is not yet ended, even on many old farms; for if you wish to clear the woods a little farther back, or straighten that jagged side, the sprouts will give way to their many nibbles. If you have none to clear, your fence corners are tending to briars, weeds, or thistles. These cannot survive where the farmer will sprinkle with salt sown broadcast over their foliage on a wet or dewey morning, and turn in the sheep. I once cleared a hedge row of willows which was very annoying to me by this process. But on the more newly cultivated lands northward there is much hard work to be saved by them. But I come now to the far greater value they are in the general management of our farms.

I am not an advocate of a summer fallow for sheep. It may sometimes be

resorted to in case of neglect by the farmer to till sufficiently to kill all sustenance for them. Our fallows should not be allowed to have grass enough on them to keep one sheep to the five acres from the time they are plowed till seeding time, except in the fence corners. But they will furnish the top dressing for them, if we provide them with plenty of straw during the winter months.

I will give my method of treating sheep in brief through the winter months and up to shearing time. Provided with racks to divide the yards so I may have lambs and small yearlings by themselves, and the flock intended for breeding ewes also by themselves. I would provide plenty of water where they could have free access to it day and night. I would also provide salt where they could eat at their pleasure, and if any unhealthiness, as skin disease, snuffles, sore lips, or any kindred disease appear, put a little tar at the bottom of a trough or box and the salt thereon; they will help themselves to both. Tar is a disinfectant. If you are bothered with ticks, I would mix a little sulphur with the salt, just enough to color it slightly; then with a clean, well littered shed and yard, I would feed at first some of the best hay I had for that purpose but twice a day and not lavishly; then as cold weather advanced, begin with two or three feeds of straw per week, and in a few weeks you may feed straw once per day, except to the lambs, which should have only an occasional feed of straw. I would prefer this feed in the morning, and a moderate feeding of hay at night, so they will eat all clean. I would commence feeding grain to breeding ewes when I commenced the straw, as a regular feed. It does not matter what kind of grain—anything you may have—gauging the quantity by the strength. Keep the yards well littered with the refuse straw from the feeding racks, and feed sufficient to have all down under foot by the time you cease to yard the sheep. This is where the pay comes in, for you will have a large amount of good manure to draw. You will need a little extra help to draw it. You will want the help to stay to spread it on your fallow, and then you will conclude to have a little more help to bind the heavy grain produced therefrom, and you will need a little more help all the way through till threshing time. You will need a few more dollars to pay your threshing bill, and at last you have received more dollars for your part than you could in any other way.

I do not indulge in covetousness, but I cannot ride by a farm where there is a stack in the field remote from buildings but that I wish the owner would either draw it into his yard or let me draw it into mine. (I am more especially affected in this way when within twenty miles of home.)

I would never feed with sheep in same apartment, but keep all out till feeding is completed; they each have a fair chance, besides the chaff and dirt is kept from their fleeces. Shear early, as soon as June 1st, even for grade flocks. I would never wash them, as I apprehend the time is not far distant when this practice will be mentioned on our statute books in the list of cruelty to animals. I believe the persons who have stood in the water up to their waists for three or four hours would plead guilty to the charge, even if they had not seen a sheep that day. Next, do up the wool in a nice condition—no foreign matter, no heavy sweat locks, but put it in such shape that you will at least not blush higher than your hat rim when the buyer opens out one. Let us have the name and the price for our wools which Ohio has kept for several years, and we can if we will but continue our painstaking. You will all feel better satisfied. You can look your buyer square in the face; he will return the

look with the corners but slightly rounded, and instead of going home saying all manner of harsh things of cheating, docking, etc., you will feel as though you had another friend. But you had better continue washing your sheep and soaking yourselves for four or five hours annually, unless you cease to allow them to run to the straw stack and help themselves, or in the dusty road in May and June, and carry hay over their backs and throw it on their heads and neck while feeding.

I wish to say, right here, that I believe what has been said about manufacturers combining to secure advantage of the wool-grower is unsupported by proofs, and, as Dr. Randall once expressed it, "The manufacturers have been as much sinned against as sinning. There is no more intelligent, honorable, public spirited, and liberal class of business men in the country. The one-third rule of shrinkage was adopted by them at an early day, when but very little domestic wool came unwashed into market. It was brought in usually by owners of small lots, who took no care of their sheep. The wool was not only often filled with wood, dirt, sand, and foreign matter, but it was often out of condition; here a fleece cotted, there one jointed, and again one filed with burs. It was not convenient to classify these with good washed wools, nor was it obligatory on any body to encourage their production. Under such circumstances the one-third rule of dockage met the case fairly enough."

As soon as manufacturers became convinced that the feeling among flock masters against the washing of sheep sprung from legitimate motives, and indicated a settled purpose, instead of a mere freak, they met it not by refusing to buy, or by holding to an unjust rule, but in a fair and business like way. I can say the same for the buyers in many instances, for they are substantially the agents of manufacturers. We are not yet settled on a proper basis for buying or handling wool, nor shall we be, until it is bought and sold, as wheat and other grain, on its merits; for no two crops of wheat are alike as to quantity of foul seed in it. The buyer should be a good judge of its quality and cleanliness, and this they will soon acquire. What should we have done last winter, my wool growing friends, but for the untiring labors of the Secretary of the National Association of Wool Manufacturers, Mr. John L. Hayes, who did the work which we, as wool growers, were not sufficiently organized to do for ourselves, when Wood's tariff bill was so cunningly prepared and supported by English capital no doubt. It was the man vs. money and time that was freely spent at Washington to defeat it. There was a vast amount of work connected with the overthrow of that bill, which Mark S. Brewer could not do, for he did not occupy the position of representing a great interest, backed by an organization, as did John L. Hayes, assisted by Wm. G. Markham, of Avon, N. Y., as representing the National Wool Growers' Association. Every wool grower in these United States owes to John L. Hayes a debt of gratitude they cannot too fully express. Yes, and to our 9,000 sets of machinery kept in motion by these manufactures we owe our 35,000,000 sheep, whose manure doubles the product of the wheat land on which they are raised; whose flesh is called the most nourishing of animal food, and which by their influence in lessening the cost of animal food to our whole population, may be said to far more than pay the increased cost of clothing to our people caused by the protective duty on wool. It seems almost useless to advance an argument in favor of improving the sheep of our State in the face of such rapid advances as are everywhere to be seen within the last few years. But I will add a word for those who are doubtful of the benefit of such improvement. I will simply give my personal experience in brief.

I have kept a debtor and credit account with my sheep for the last six years, and starting with a flock of 150 full blood Merinos, at a moderate price, and decreasing my number somewhat as I bettered their quality, I have now 90, both old and young, which will sell for not less than from $25 to $30 per head on the average, and they have paid for themselves in the sale of stock, leaving me the wool and manure for the cost of keeping. Besides this, I feel that in most instances I have also been of benefit to others in a similar proportion. But even if we all cannot do this, they can at least, those who have low grade flocks, increase their heft of shearing, of equally as good wool, from one to three pounds per head, and get a better carcass the first cross with a well bred animal, and you can gain much by your second and third crosses, but not in so marked a degree.

I say, farmers of Genesee, keep your sheep better, for although they will give you some annual profit with poor keep, they will readily respond to generous food and care, keep their wool cleaner, at all times, shear earlier, as one great means of clean keep and health. Improve your flocks by judicious breeding and proper culling. Interchange ideas with each other, practice what you preach, and leave nothing undone which will add to the true comfort and value of your flocks.

Mr. N. A. Beecher read the following essay on

"FRUIT CULTURE ON THE FARM."

Mr. President, Ladies and Gentlemen,—As this subject has been widely discussed in our Pomological Works, and in many ways, I shall be brief in what might be termed the practical part of Orchard Culture.

How to Plant and Grow an Orchard.

Select a deep rich soil. Should there be any places that are inclined to be wet, they must be well under-drained before setting the trees.

Let the ground be thoroughly prepared, then set the trees about an inch deeper than in nursery, in well pulverized soil, using leaf mould, if you choose, but no manure. The latter, if used, should be on the surface as a mulch. Before setting, cut off all the roots bruised with spade, from the under side, so that the cut will set flat upon the ground. From this cut many little rootlets start out and go directly and naturally into the soil. Hence the necessity of following this plan. With your hand place all the main and fibrous roots in their natural position. Now let some one sprinkle on fine soil plentifully, while you perforate the same with your fingers, seeing that every vacuum is thoroughly filled and made compact about the roots. After this has been accomplished, fill in around the tree and pack firmly the soil with your feet, and you will have no trouble in making the trees live.

Cultivate with some hoed crop four or five years, never letting it lie in a sod more than two years at a time, if you would keep it healthy and vigorous.

How to Plow the Orchard with Horses.

Have low hame harness; take turrets out of back pad; give horses loose check, or none at all. Length of double whiffletree, 2½ feet; single whiffletrees, 22 inches. Wind whiffletree next to tree thoroughly with heavy cloth; put a careful man hold of the plow handles, and set him to work with this injunction: "Sooner skin your own shins than bark a tree." A man that cannot harrow in an orchard without bruising a tree ought to be sent to the Agricultural College, or somewhere else.

Pruning.

The best time, in my judgment, is from the 20th of June to the 20th of July. A very good time is from the 20th of February to the 20th of March. One objection, however, to this season of the year *is*, that it induces suckers. All sprouts should be kept off the base of the tree, as they greatly retard its growth.

Washing Trees.

Would recommend washing young trees in lye in the spring, also in the month of July; it adds much to the health and vigor of the tree, and is a protection from vermin.

Pasturing the Orchard.

The safe way is not to turn in a hoof of any kind, unless it be hogs. Horses that will not gnaw trees may, perhaps, be turned in with safety. Many a man has repented, when too late, turning sheep and cattle in the orchard. Unless the orchard is made an object of much care, and man's *will* brought into requisition, guarding it as he would the apple of his eye, he will not be likely to succeed.

Cherries.

The sweet cherries have not succeeded very well with me, unless it be the more hardy sorts. The Gov. Wood and May Duke stand our climate very well, but I think our native red cherry and what is called the English cherry, are most reliable and give the best satisfaction.

The Smaller Fruits.

Strawberries, raspberries, gooseberries, currants, and grapes, are all indispensable to the comforts, nay, luxuries, of the household, and *all* can be successfully grown in abundance, with but little care.

Pears.

I have long since discarded dwarf pears in nursery and orchard, and quite agree with Gov. Crapo, deceased. He asked me, years ago, "If I cultivated dwarf pears." I replied that I did. Said he, "You can sell all you grow of them, but my experience is, that they curse both propagator and purchaser."

There is a gentleman living a little west and north of me, in the township of Flushing, Mr. John Kimmel, a careful and expert fruit grower, who has had considerable experience with the dwarf pear. He purchased some fifteen years ago, of T. G. Yeomans, N. Y., the following varieties (dwarf): Blood Good, Doyenne d'Ete, Flemish Beauty, Bartlett, Vicar of Winkfield, Beurre Gifford, Duchess d'Angouleme, and Beurre d'Anjou, giving them for years the best of cultivation and care, and lastly allowed them to lie in sod, mulching them thoroughly, and says, "They have *all* proved a failure."

The hardy standard varieties are the ones to plant without doubt. The Bartlett is the only one of several sorts that has failed with me as a standard. In 1874–5, it was killed to the snow line, and has been more or less injured since then. I regard it as too tender for this climate. The most we have to fear from pear culture is "blight," and the best remedy I know of for it is to set out *two* for every one that dies.

The Apple.

The history of the apple is as old as that of man, and its attractions and temptations have been felt and realized by most of the human family; and he

who has been tempted by this most excellent fruit, from the hand of Eve's fair daughters, finds himself as weak as his prototype, Adam.

The full grown orchard, bending with its burden of precious fruit, in autumn was always a sight that had great attractions for me. Its fruit not only satisfied my taste but filled my whole being with pleasure and delight. If I ever had an excess in appetite for the good things of this world, it was for her most precious fruits.

I never shall forget, when a boy, standing beside the church-yard fence that separated it from a garden filled with choicest fruits, waiting in their ripeness for some anxious hand to pluck and eat the same. That hand was mine, but I dare not pluck and eat,—it was not my father's garden. I thought of our first parents, and did not wonder that they sinned, and I believe I should myself had I not stood on hallowed ground.

Those grapes that hung in beautiful clusters from the arbor, rich and purple; those large golden peaches, with pink cheek, blushing to be mine; those apples, in all their beautiful colors, ready to drop into my hands, as I thought, are photographed upon my mind as clearly to-day as when I stood in the church-yard of my native home. For me to have lived and not had an orchard, I would not have been true to my instincts; consequently the first thing, after purchasing a home was to plant an orchard. There had been set out, the fall previous to purchase, fifty apple trees, but in the spring of 1857 only one dozen were alive. A selection of fifty more trees, of which one-tenth was early, one-tenth fall, and the balance winter, was made; twenty of the latter were purchased for Esopus Spitzenburgh, and fortunately proved to be Northern Spy. Our means being small, we concluded this would do until we could raise our own trees. Accordingly the next spring, 1858, we started a nursery of 12,000 apple trees, adding to it from year to year, in a small way, until the present time. After the trees in nursery had attained a sufficient size for planting, I commenced extending my orchard, until it numbered some 800 trees. I found, after a few years of experience, that some of the varieties in nursery and orchard did not do well, and for what cause, I could not tell. Consequently I became much interested in the study of this matter, trying, if possible, to ascertain the cause. Years passed on and still the mystery was not solved. Finding I could not succeed with certain varieties, I discarded them altogether. The Esopus Spitzenburgh and Roxbury Russet were among the first to share this fate. Have been replacing them from time to time, as they have died out or become worthless in the orchard, with Northern Spy, and shall not be sorry when the last Esopus Spitzenburgh ceases to be in the family of my orchard. Out of twenty-six (Esopus Spitzenburgh) I have six of them left, most of them feeble. The Roxbury Russets, have done somewhat better.

The very severe winters of 1874–5 cleaned out our peach trees and cast a blight upon our orchards that will not be forgotten for generations to come. Not until this time did I know that freezing was the great trouble with our orchards. The next spring and summer dead and dying fruit trees were found all over central and northern Michigan (that is in the Lower Peninsula), and many of those that have finally survived are badly affected. We all felt this great loss, but no one so keenly as propagators of fruit trees. My nursery in June looked as though the fire had run through it in sections. Some varieties were dead and dying, while others were perfect to the terminal buds, standing up like so many living monuments to the departed, impervious to the long

keen grip of kingly frost. The great mystery of the last few years to me, in nursery and orchard, was all in a nut-shell. Nature had unfolded to all the great truth, and taken upon herself the blame, if any, but all did not receive the truth.

The result of these facts have led to much wild speculation with some, and the casting of blame where it did not belong: but of this I will say nothing, leaving the facts in the case to rectify and correct all mistakes.

I feel that these facts are of vital importance to the fruit growers of Michigan, and I am not alone in the discovery of them. Our late works on Pomology are full of these corroborating facts, and he that would be benefited by them must follow the light therein contained. Chas. W. Garfield, Secretary of the Pomological Society of Michigan, informs me that they are about to issue a catalogue of Michigan fruits, which is intended to convey the following facts:

1st. A description of each tested variety, with its name.

2d. Comparative merit of each kind for cooking, dessert, and market.

3d. Adaptability of each to various sections of the State.

4th. Peculiarities that determine the value of each sort.

I am glad that this announcement has been made, and is about to be executed. I believe it is the duty of that Society to keep these facts, and all others of importance, before the people, and to repeat them from time to time, as we would the principles of mathematics, for the benefit of the horticulturist and his posterity. I think these facts cannot be pressed too strongly, when I realize how many thousands of dollars are paid out annually for fruit trees in this State, and how very small the compensation realized many times, simply because of an unwise selection of varieties. Allow me to cite one or two examples:

I had an agent canvassing in the vicinity of St. Louis, Mich., who came across a man that wanted a few trees to fill out his orchard, if he could get the varieties he wanted. He told him he could. Said "he had filled out twice before, but would try it once more." He wrote on the back of the order, "Fill to the letter or not at all." I did so, and stated on the back of the order, likewise, that in my judgment, his choice was an unwise one, and that in all probability he would soon want to fill out his orchard again.

His choice was Esopus Spitzenburgh, Swaar, and Peck's Pleasant. These varieties are naturally feeble growers, and what is still worse, decidedly tender. I find some have placed the Peck's Pleasant among the hardy varieties, but it has not proved itself as such with me.

In August, 1876, I met a gentleman in Alpena, Mich., who had two years previous set out an orchard of 100 apple trees, 75 of which were Esopus Spitzenburgh. He said the Spitzenburghs were nearly all dead, and that he was discouraged.

In addition to those varieties named as tender, I would add Gravenstein, Porter, Fall Pippin, Golden Sweet, and King of Tompkins County. The Baldwin, and R. I. Greening have not been a success with me; still, I think if these two varieties were top grafted upon some hardy stock, we should find it an improvement. They are too popular and valuable to be thrown aside without further experiment.

I admit there are some exceptions to the general law, for occasionally we find a sound tree among the tender varieties. Whether this is owing to the stock grafted, the soil, or favored location of the tree, I am not yet able to

determine. It is true, also, that some of our "apple-stock" is very tender, and some is very hardy.

I find, also, that the tender varieties are more subject to the ravages of the borer and the armies of insects that prey upon our fruit trees, and that among this class we find the largest per cent. of inferior and wormy fruit. If any one will take the pains to visit the orchards of this and adjoining counties, as I have done, and study the different varieties as to health, hardiness and the quality of fruit borne, I think they will bear me out in this conclusion.

In the light of these facts, may we not only be able to submit to that immutable law that knows no change, but to act more wisely in the selection and distribution of those hardy varieties of fruits that have been showered upon us in abundance for our comfort by the All-wise Giver "of every good and perfect gift," such as the Northern Spy, Ben Davis, Newark Pippin, Yellow Bellefleur, American Golden Russet, Duchess of Oldenburgh, Lyscom, Fameuse or Snow, Shiwassee Beauty, Seek-No-Further, Red Astrachan, Early Harvest, Spice Sweet, Talmon Sweet, Autumn Strawberry, Primate, Rambo and Canada Red, which should be top-grafted under all circumstances.

I have occasionally read statements in some of our New York papers much like the following: "If I were to plant 100 apple trees for market, I would set out ninety-nine Baldwins, and then set out the other a Baldwin." Have seen much the same language with reference to the Roxbury Russet, King of Tomkins county, etc., etc. Now it is unfortunate for many that such statements could not be qualified as to locality, for it is well known that the above named varieties flourish exceedingly well in Western New York, and yet this fact is not altogether true of many parts of Michigan, and would not be wise for the farmers of Genesee county to act upon.

The spring of 1875, following that very severe winter, I visited several places in the State of New York, and gathered some facts that I will compare with others in Michigan and Wisconsin. In the counties of Western New York, bordering on Lake Ontario, Niagara, Orleans, Monroe, the thermometer had reached 6° below zero. At Canandaigua, Geneva and Auburn it had been somewhat colder. At Syracuse and Utica there was a marked difference, while at Norwich, N. Y., the thermometer had reached 34° below zero. At Binghamton, Oswego, Elmira, 35° below. In this city (Flint), if I am correctly informed, 33° below, February 9th, 1875, Kalamazoo, Mich., 34° below, Grand Rapids, 40° below, Beloit, Wis., 40° below, Sparta, Wis., 48° below; while at South Haven, Mich., February 9th, it touched 16° below only for a few minutes.

The next autumn they had a fine crop of peaches in Western New York, and if my memory serves me right, there was a light crop in the southwest part of this State. I mention these facts to show how important it is that we study the climate of our locality as compared with others, and hope in the future that we may be able to act more wisely and judiciously.

Ex-Governor Bagley's name was next upon the programme, but a telegram had just been received from him expressing his regret that a severe cold prevented his being present.

EVENING SESSION.

The following report of the committee on resolutions was read by the secretary and adopted:

WHEREAS, The present system of taxation causes the heaviest burden to fall upon the farming community, by taxing the real or nominal owner of real estate, making no deduction on account of his indebtednes, no matter what proportion it bears to the property he represents; therefore,

Resolved, That it is the sentiment of this body that our legislators, during the present session, should give us a law more truly equalizing the burden of taxation.

Resolved, That the thanks of this meeting be tendered to the State Board of Agriculture for granting our request for a Farmer's Institute in this county.

Also to the members of the college faculty, to Dr. Manly Miles, and all others who have contributed lectures and essays to our great profit and interest at this institute.

Also to the Fuguenoids for their excellent music; to the local committee; to the president and other officers of the meeting; to the citizens of Flint for their generous and hearty entertainment of guests; to the members of the local press for the interest they have manifested in this meeting, and to the school district board for the use of this fine and capacious hall for the purposes of this institute.

Resolved, That the interests of agriculture in our county would be advanced by the organization of farmers' clubs in the different townships to hold stated meetings during the fall and winter, and that these should unite annually to the holding of a county institute.

A. ROOT,
H. R. DEWEY,
G. TOWNSEND,
Committee.

Later in the evening Mr. D. P. Dewey offered the following, which was adopted:

Resolved, That the thanks of this institute are due and hereby tendered to Prof. Parker of the institution for the education of the deaf and dumb and the blind for the kind invitation given to the members of the institute to visit the institution under Prof. Parker's charge. We regret that the limited time at our command has prevented the acceptance of the invitation referred to.

Prof. Geo. T. Fairchild gave his lecture entitled "Science and the Arts in Education." (See lectures given at more than one institute.)

The exercises closed with a lecture by Dr. Manly Miles on "Horse Breeding in its Relation to Farming," illustrated with the magic lantern. We are sorry we cannot give even a synopsis of this masterly lecture, which made clear the scientific principles on which alone improvement of stock can be predicated. Among the illustrations of the lantern, was a series of instantaneous photographs of a fast horse in motion, trotting and running, taken by an automatic electro-photographic apparatus, recording the action of the horse in motion, and scientifically determining exactly what the motion is. The conventional figure of the trotting or running horse is by those photographs shown to be naught save a pictorial myth. In taking the series, the exposure for each negative was about the two-thousandth part of a second.

HOWELL INSTITUTE.

This institute was held in the court-house January 20th and 21st. Hon. Edwin B. Wynans was chosen to preside. Each session was opened by prayer and music. The attendance was large, the court house being crowded nearly all the time, and quite a deep interest was taken in the subjects under discussion.

In opening the institute Judge Wynans made a brief informal address, extending a hearty welcome to the professors and others in behalf of the committee of arrangements. He said that any effort to promote the interests of agriculture would be highly appreciated by that community. Their farmers had made very rapid advancement during the past few years, and he knew of no reason why they should not, as well as any other class, come to the front and champion their own interests. As farmers they were coming to a truer conception of the grandeur of their calling. He hoped that the exercises of the institute would be interesting and of lasting benefit to the farmers of Livingston county.

Mr. Theodore Welsker read a paper on "Bee Culture," in which he advised the farmers to keep bees both for the pleasure and profit they afforded. He said that now it was not difficult for a beginner to obtain the requisite knowledge, as there were several excellent journals devoted to the apiary, and also a number of good books had been published relating to the same subject. He argued that it was much more important that farmers should raise their own honey from the fact that adulterations both of honey and syrups were so extensively practiced.

R. G. Baird, Secretary of the State Board of Agriculture, gave a lecture entitled "Requisites of Successful Farming." (See lectures given at more than one institute).

FORENOON SESSION.

Prof. A. J. Cook gave a lecture on the "Destruction of Injurious Insects." (See lectures given at more than one institute.)

Mr. Geo. B. Wilkinson, of Marion, read the following essay on

IMPROVEMENTS IN WASTE PLACES.

Land is plenty in America.—Enough and to spare. Hence in the minds of some people grave doubts exist as to the practicability of expending much money, that is, labor, upon land that requires more than the ordinary process of chopping, logging, &c.; especially since there is some demand abroad for American frogs. Frog culture, however, has its drawbacks. One of these is the fact that it is invariably combined with mosquito raising. Fevers, also, might abound in localities where frogs were raised; this, however, depends upon certain circumstances which we will not enumerate.

Land which produces the above mentioned crops, here in Michigan we denote,

as by common consent, waste. Now we *do* wish to see such land put to better uses than raising frogs, mosquitos and fevers. We have various reasons for such wish:—First, it will add beauty to our State; second, it will add health to our people; third, it will put money in our pockets. Are not these reasons potent? Either one, alone, should be sufficient to induce farmers to renewed activity in improving our lands known as waste. We do not claim to have made any discovery, in publishing the fact that our waste places will produce better things than frogs, mosquitos and fever, but simply to demonstrate a principle. A principle which was applied by various people upon the Pontine Marshes of Italy, before the long night of the Dark Ages; and by the Dutch in Holland, four hundred years ago. By a continual demonstration of this principle, we hope to induce farmers in general to emulate our improvement. Demonstration is necessary, because men choose rather to walk by sight than by faith, when it becomes a matter of profit and loss.

Need we tell you that the feasibility of improving our waste land has been thoroughly demonstrated in this county—many here will willingly affirm this fact, being positively posted in the matter. Yet it might not be amiss to relate a few incidents, when the number is legion. We shall do it, because all the glory in beautifying Michigan does not belong to Hon. Z. Chandler and Judge Miller, but should be divided amongst our very neighbors. Not that we wish to detract from Mr. Chandler's merit,—thousands well know that he has been a "God-send" to our neighboring county. Activity in a useful cause assures credit and honor,—and most assuredly Messrs. Coleman, Mitchell, Basing, Clements, Padley, Fishbeck, Drewry, Smith, Clark, Wilhelm, Twilley and others, though their operations have been less extensive, their demonstrations have been equally valuable. The zeal of Messrs. Padley, Clark, Wilhelm and Mitchell has caused wheat to grow upon land where marsh grass and bobolinks delighted to dwell. Thomas Clements, of Marion, has this season raised a very superior crop of corn upon a marsh noted for the immense size of the bogs, its coarse grass and brakes. Messrs. Drewry, Fairchild, Basing and Tuilley are raising excellent herd's grass on land but quite recently called waste. We do not pretend to say this land is the best. It will have a tendency to return to its native state if not continually cared for. Ditches will choke, and briers and thistles may succeed the grass, to the annoyance of the occupant. But is there any great excellence, in any of our modern industries, without a great amount of pains? Methinks not.

The question arises, how has such good results been acquired? We will briefly state the *modus operandi*. Large ditches, for leaders, have been opened to the required depth, so as to rapidly carry away the superabundance of water; connected with this leader are other ditches of smaller caliber. Many of the smaller ditches are tile drains—some are made of wood—inverted troughs; these troughs answer a good purpose in many places for quite a number of years. (I have them nine years of age yet doing good service.) The leader should always have a greater depth than the auxiliaries, as more or less flood matter is likely to lodge and back the water so as to produce the chokage alluded to. Experience indicates three to four feet as the depth necessary to draw out the water. It is impossible to stand here and give infallible rules by which to guide farmers in draining waste places. The amount of water, kind of soil, the fall, and the use to which we will put the ground, when improved, are important things to be considered. One thing is certain, that is, a uniform grade must be obtained to assure success; and second, only to uniformity is

capacity, especially in the tile drains. If the drain is too small there may be gullying which might displace the tiles, hence destroy the effect of the drain. Nature commences to operate upon the soil immediately after the water is drawn out of it, by rotting the vegetable matter, and condensing the mineral. This makes us think our ditches have filled up. But a close examination will show that the earth has settled. Thus the miry becomes solid—which is the first requisite to improvement, as without solidity it is almost impossible to cultivate the ground, for in this age of machinery we do not wish to return to the breast-plow of the 17th century, by which two men skimmed over land from one to two inches deep; neither do we wish to employ the cumbrous wooden shoes of the 18th century upon our horses, that we may be able to plow our waste places. Take out the water, and my word for it, there is no more trouble in plowing land in which vegetable matter predominates, than there is in any other kind of soil. Furthermore, if it is well drained such land becomes much drier than clay loam, and can be plowed with less than half the team. Around most waste places there is land which, by reason of its coldness, is not very valuable. Drawing out the superabundance of water from the actual wastes often makes the half waste excellent. No matter what the composition of the soil if wet and therefore cold, draining will render it much better. The drain answers a two-fold purpose: It becomes an outlet for the water, and a conductor for air—of how much importance the latter office we are unable to determine. Nevertheless we all acknowledge the great power of air in softening hard lumps, counteracting the toughness of clay, and ameliorating unadjusted matter to the necessities of vegetation. After draining our farmers usually plow, some deep, some shallow—all having view to decomposition, for as is well known the excess of water has preserved the vegetable matter in our waste places, making it unfit for the production of other kinds of vegetation. Some sow buckwheat, thinking it capable of producing the proper subjugation; others allow the ground to lie fallow one or two summers.

Either process has a good effect upon the soil, and it would be merely a guess to pretend which of the modes is the most beneficial. The herd's grass is commonly sown in the early autumn—say September. It produces a good crop the first summer. After mowing it will produce a great crop of rowen (or after math), which makes fine pasture in September or October. This rowen is better fed off, as too much mulch might produce suffocation. Winter draining is essential, as a sheet of ice might smother the herbage. But the great enemy, on such soils, to timothy or herd's grass is the meadow mole. Perhaps it would be well to allow hawks to multiply, and a few cats are useful as a precaution against these vermin. If corn is raised upon these vegetable soils, it should not be planted before the first of June, as the whole of our diluvial soils are especially subject to frosts—both late and early. It is believed as decomposition destroys the vegetable fabric in the land it will not cool so rapidly; but as far as we know we have not positive data upon which to predicate this hypothesis. Fall frosts may overtake a corn crop, yet early varieties will mature, most seasons, in ninety days upon rich mucky soils, if properly drained; therefore corn planted June the 1st stands a good chance three years out of four. Was not this meeting social,—class-meeting like,—asking for experience? I would not be egotistical enough to mention myself. Under the circumstances it looks much like duty to tell how I succeeded in raising white beans upon marsh land. Of the draining it is useless to speak. The ground had been pastured two years immediately preceding the present. On the first

day of last June we plowed it, seven inches deep, laying it over in good style, immediately harrowing until well pulverized and planted as on ordinary land, on the fourth of June, in rows four feet apart, and the hills eighteen inches apart in the row. They required but little attention, as few weed grew, until the pulling time. They required one week more time to ripen than on the adjacent upland. Experts could not tell which was best crop, upland or marsh, "both alike good;" twenty bushels per acre.

In respect to cost of improving waste places, we will say but a word; time forbids. But on two occasions we have known the first crop to refund the entire expense. On other occasions we have seen two or three crops fail in returning the money expended. We have theorized enough. Theory is not worth much. It is cheap. It can be bought of every town or country editor by the yard. Improving waste places is pretty much all theory if we take them for it, and without many hard knocks. But truly hard knocks accomplish the work. Yet, best of all friends, is the satisfaction of knowing that the country is the better for our toil; more beautiful, more healthy, and more productive.

Mr. James Harger, of Marion, read the following essay on the

EDUCATION OF THE FARMER.

If "mind makes the man," and this alone makes him different from other animals, it seems but rational that he should desire to improve this quality to the highest degree. To the cultured mind, the thought of mere brute existence is repugnant, while to the uneducated, sensual pleasures,—to eat, to sleep, to exist without bodily pain, often seem all-satisfying. Besides the desire and determination which should exist in the mind of every member of a civilized community to stand as man, high above the brute, adorning his position, there is in most men a love of approbation or ambition, which stimulates to improvement. Few persons like to be thought inferior to those of the same class that immediately surround them.

The professional classes, like the teacher, the lawyer, or the physician, whose stock in trade is the knowledge they possess in reference to their special calling, and whose associates are people of education, have everything to stimulate them to activity of mind. It is an old saying that "'tis better to be a king among fools than to be a fool among kings," so that the person who attempts to stand with those of the learned professions without the learning and knowledge and culture usual to those of his calling is a disgrace to his profession and a by-word among men.

But the farmer, the man who maintains himself by tilling the soil, is very differently situated. Among his fellow farmers, indeed, among all classes it is generally agreed that to till the soil with success and profit does not require a highly cultivated mind. A strong frame and a willing hand with, common sense and practice, are regarded as the especial requisites of a farmer.

However this may be, whether these qualities are in fact all that is needful in conducting the operation of farming successfully, or whether a scientific knowledge of the why and the wherefore of every act in cultivating the soil would give the possessor of this knowledge advantages commensurate with its acquisition, or as we say, that "will pay." One thing seems evident, which is that farming as commonly practiced tends to a dislike for study and thought,—indispensable requisites for the improvement of the mind. A person starts in

life with high hopes and aspirations, his advantages for education have been good, and he has improved them well; is informed in many sciences,—has been a teacher perhaps. He resolves to be a farmer. It is the most independent of all the avocations of life. It is healthful also, and he firmly resolves to pursue through life a path, intellectually, much above that of the general class of farmers. He may for a while take the time which is absolutely necessary in order that he may keep even with the progress of the human intellect in the arts, and sciences, and literature of the day, or that he shall not forget what he did know. But as time wears on and he becomes attached to his occupation, as he must, if he would succeed and make it a sure means of support, he finds that the farmer's work is never completely done, and his mind never free from the cares of the farm. Each day as he returns from his labor, too weary for thought or study, and goes to rest he hopes that soon his cares will lighten, that he may take some thought of subjects outside of those connected with his daily occupation, but as weeks and months pass by without relief he ceases to think of any change. Each returning season brings its labors and cares, which are followed in the same order year after year, his thoughts in one channel, almost as regular as the sun. Is it a wonder that such at the age of forty or forty-five years, when just in the prime of life and manhood, find that instead of having improved their mental faculties as they might have done, do not, in fact, occupy the place in society, intellectually, which they did at twenty-five, yet I think facts will verify the assertion as regards the farming class generally. It is only a natural result, when the physical frame is tired and weary, it seeks repose, and the mind with it.

The exertion, the will, every energy of mind and body, which is brought to bear, and which seem absolutely necessary at first, to avert failure, and afterward to secure a competency, seem often to change radically the whole character of the man. When a competency has been gained, and he has all of the wherewith to help himself which he can desire, he too often has forgotten the text which was well appreciated earlier in life, "'tis mind makes the man," his ambition to rise intellectually has passed away, and he dreads to grapple with questions requiring much mental power. One thing we are not apt to lose, which is the love of gain, which as life wears on, is likely to possess us, to the exclusion of every noble object, and that which was formerly desired as a means, for the attainment of higher ends in life, become the end and aim of existence.

It seems that a proper development of the mind is incompatible with circumstances that do not admit of leisure for thought and study, and as the farmer necessarily has very little of this, his best efforts to maintain intellectual equality with those more favorably situated are attended with much to discourage. Knowledge is power. Whoever comes in contact or associates with another of superior knowledge feels the degradation incident to every species of inferiority, and to the service of this power have the farming classes of all ages been compelled to submit. In feudal times, five hundred years ago, all learning seems to have been possessed by the clergy and nobles, who had wealth and leisure, but the tillers of the soil, their slaves and vassals, seem to have made little or no pretense to mental culture. Commerce and trade reared a class of merchants and gentlemen with wealth, and consequently the means of improvement, but the farmer from the earliest time until recently, however great may have been the desire, has been deficient in means, for the strife in life for those things which depend upon education. Society is so constituted that what-

ever may be the ability or mental endowment of an individual, he must submti in a measure to the condition of the class to which he belongs. Those accustomed to rule will not yield power until compelled to do so. Human nature is ever selfish, and those accustomed to wield the power incident to superior culture and knowledge will be unjust in acknowledging the ability of an individual, however deserving, belonging to a class over which they are accustomed to wield intellectual ascendancy.

But it is no longer necessary that any class of persons in this country need submit to a condition in which they necessarily feel the degradation of ignorance, if they but make a right use of the means at their command. Free schools are within the reach of every person in the State, and the acquisition of knowledge depends wholly upon the capacity of the individual, and the will to obtain it. Although the educational advantages of the farmers of to-day are far in advance of those enjoyed by their class at former periods in the world's history, yet they do not seem to awake to the necessity of improving their opportunities to the utmost, as they should, contenting themselves with the idea that they know enough for farmers, and allowing themselves to be ruled, led and taxed at the will of others, in exchange for the fulsome flattery that theirs is the most independent and enviable condition of any in the community. Still they are not satisfied, and to be dissatisfied with the present is the first requisite for a change. Farmers complain that, while they outnumber all other classes in the country, they have little or no representation or voice in the government, and that a large majority of our public men are from classes numerically very small among the people, and ask why is this? They can ponder over this question long and with profit, and good sense will suggest an answer like this: The statesmen and legislators who manage the affairs of the nation should always be men of superior knowledge, who well understand the wants of the public service, and such are not readily found in a class which, although it now numbers in its ranks many able and intelligent men, yet a large majority of which scarce ever in their lives gave a thought to such subjects. Hence they are so commonly chosen from the classes of professedly educated men. The answer is not satisfying, but galling to the pride of the farmer, and awakens a desire that it may not always be so, and "where there is a will there is a way." But they must know that to aspire to high public position means, that in mental culture and learning they must not shrink from comparison with any in the land, and, with these qualifications, the farmer need not fear to ask for what he will, but demand them. Some of the disadvantages under which the farmer labors in acquiring and maintaining that degree of mental culture necessary for a creditable comparison with other classes we have endeavored to show, but with a proper understanding of the situation they can be overcome, if he but will. He must know that, instead of giving up his whole time to toil and labor, a portion must be devoted to thought and study. If he hopes that his family will stand equal, making equal progress in learning with the inhabitants of the towns, they must have the advantages of books, teachers and schools of as high an order as any. Money is as necessary to the farmer as to any class, to accomplish desirable ends, and he should recollect that mankind are naturally selfish, and, if he does not look well to his own interest, others will rob him, and that in the interchange of the commodities of life, when he saves as much of the profits of his own labor to himself as possible, he wrongs no man. Others may be stimulated to mental culture as a means of procuring daily bread, but the farming class, earning their bread by the sweat of the brow,

must not falter in efforts for education, unless he would continue behind in the race of life, in a country where all are born with equal rights and privileges, but press forward, conscious that, in so doing, they will develop a higher degree of manhood. This accomplished, and no occupation in life will offer advantages for the enjoyment of every faculty, both mental and physical, making up the sum total of human wants, superior to those possessed by the farmer. The wants of our country demand it.

DISCUSSION.

Hon. Wm. Ball, of Hamburg, said: There is one thing in the essay that I do not agree with. I do not think that the farmers as a class are inferior in point of education.

Take the present audience for example; would they not in this respect bear comparison with an audience from any other class of people. Was it not a fact also that a very large proportion of our schools are taught by the sons and daughters of farmers? He claimed for the farmers that in regard to general intelligence, as a class they were not behind others, while at the same time they all needed more education in the line of their work.

Mr. Harger replied that in the portion of the essay referred to by Mr. Ball he was speaking of a class of farmers who were not represented at such a meeting as this, and that there were very many of them of whom the remarks made by him were entirely applicable.

Prof. C. L. Ingersoll gave the following lecture on

MILK FEVER IN DAIRY COWS.

There is always a dread accompanying the attack of a disease, of the workings of which we know but little. This dread is usually increased by the sudden attack, by its violence, its shortness of duration, or its fatality. This disease of which I purpose to speak for a few moments is of this character, and sometimes strikes down the animal in so short a time as to wholly unnerve and astonish the owner. Before he has had time to do anything toward assistance the animal may die. Diseases that afflict the ruminants are much the same in character as those that afflict the human family, and may be classified as follows:

1st. Contagious or epizoötic diseases: those that pass from one to another by means of infection; and

2d. Sporadic diseases or non-contagious: those where the seeds of disease are engendered in the system, and being developed there, affect only the single animal, dying with the animal, and not transmissible during sickness or after the animal's death.

To the first class belong the rinderpest of Europe, the foot and mouth disease lately so prevalent in Great Britain, the Texas cattle fever or splenic fever, and other diseases of this character.

To the second class belong milk fever or parturient apoplexy, pneumonia of some kinds, and the ordinary diseases that are common and affect the single animal. The losses that occur yearly from the diseases of the first class are enormous, and medical treatment seems to have little effect, as a very large percentage usually dies. When we are visited by one of these diseases we feel that we are almost powerless, as individuals or communities, to take hold of and try to stamp them out, much less to try and investigate the causes that lead to such results.

This work has generally to be left to the strong arm of the government, and a commission appointed for the especial purpose, such commission being empowered to employ men who are experts, or those whose thorough training has eminently fitted them for the work. Such a commission has but recently been appointed to investigate the disease known as "hog cholera," and which has caused such vast losses to the farmers and breeders of our country.

The report of the Commissioner of Agriculture gives as the approximate losses for the year 1877–8 over $10,000,000 from that cause alone, while the losses from other kinds of live stock swell the amount to over 16½ millions ($16,653,428). The live stock interests of our country are immense. In a report on the number and value of live stock in the United States we find that there were over 100,000,000 domestic animals, valued at $1,647,719,138. (You will thus see that our stock losses are about 10 per cent. of the valuation.) This number and their aggregate value seems so vast that I will give you the report for Michigan, in which I find nearly 5,000,000 domestic animals (4,982,100), valued at over $60,000,000 ($60,565,176). This shows you that nearly one-twentieth of the live stock of the United States is found in Michigan, and about one-twenty-seventh of its value held in our midst.

In the matter of milch cows we find that one-fifth of the value of the live stock of the State is of this class; while taking the United States together we find nearly the same proportion existing. This will explain to you in a measure the interest we should take in this subject, while beside this I feel that there is little definitely understood about the nature of the disease and its prevention, or its treatment after the attack.

History and General Characteristics.

This disease known as milk fever is, properly speaking, not a fever at all, and so far as the secretion of milk is concerned may or may not affect it. Even among those who were skilled in veterinary science, until a comparative late day, much division of opinion has existed. According to Fleming it has been called at various times puerperal fever, or paralytic form of the same, milk fever, puerperal apoplexy, paraplegia (paralysis of both sides of the animal), vitulary fever, vitulary apoplexy, puerperal typhus, etc., etc. In England it is called parturient apoplexy. The first notice of it is said to be in a work published in London in 1807. Shortly after this, as the various breeds became improved and more valuable, the disease began to attract attention from its greater frequency. It usually attacks the best cows in the herd,—those that are heavy milkers and those that are in good flesh, or fat.

It has attracted some attention in various parts of our own State, and has been attributed to various causes, and called by various names, as horn distemper, calving fever, etc. Various modes of treatment are prescribed varying with the ideas of individuals, and usually not very definite and applicable.

Symptoms.

The animal is usually attacked within twenty-four hours after parturition has taken place, and with no warning or premonitory symptoms. The cow has usually had an easy delivery (the placenta having passed away at the usual time), and appears well and even lively. Suddenly there is an exhibition of uneasiness and drooping of the head, dullness, with weeping of the eyes, lowing as if in pain, food is refused or taken sparingly, rumination ceases, the cow pays little or no attention to the young calf, of which she was so fond. There

is coldness of the horns, nose and of the lower part of the limbs,—no moisture upon the end of the nose. The breath is more hurried and perhaps irregular, as if in pain,—the pulse hard and wiry, or perhaps normal. In a very short time the animal staggers, and seeks, by lying down and rising, to change its position often. After a few changes, paralysis seizes the rear half of the body, and although the effort to rise may be made, the animal gives up in despair. The head is then usually thrown around toward the flank, the breathing becomes more labored, and unconsciousness follows.

Saliva drools from the mouth and the paralysis gradually creeps forward until the muscles that control deglutition are paralyzed. Medicines can only be administered at this stage with the greatest difficulty, and if given in fluid are liable to produce strangling, and the animal to be choked to death.

The animal usually lies in this condition for a few hours,—the eyes staring, the balls fixed in the socket, with no sense of sight. As soon as the first symptoms of paralysis are observed the digestion ceases, the normal secretion of the kidneys is stopped, and neither liquid nor solid excrement is voided.

The secretion of milk is usually somewhat checked. There seems to be a general blocking of the wheels of nature. Toward the very last the animal will stretch itself prone upon the ground, and seems to be without power to lift the head or scarcely to move. There may or may not be an accumulation of gases in the rumen or paunch, and in a short time death ensues.

There is another phase of the same disease, where the symptoms are somewhat varied and a large amount of force is expended as soon as the animal falls down and paralysis takes place. The cow will throw the head on either side with such force as sometimes to break the horns and bruise the flesh very much, and this is kept up in spasms following in rapid succession until death ensues. These symptoms follow each other in such rapid succession that the animal may be paralyzed and unable to rise in one to two hours after the attack is noticed, and death frequently puts an end to the scene in ten to twelve hours, so rapid is its course.

Nature of the Disease.

As to the nature of the disease much has been written and many theories are extant. Some of these are probably due to the fact that this disease has not always appeared alone, but that there are complications often arising. Frequently pneumonia may ensue from the lodging of substances in the air passages in giving medicines or in other ways.

Another way in which its nature has been misjudged is in the fact that many have mistaken two concurrent circumstances for cause and effect. For example, a man who lost his cow found gravel stones in the reticulum, together with some indigestible woody fiber of large cornstalks, and reasoned that they were the primary cause of his cow's death. Another who calls it horn distemper, or if he does not treats it in the same manner, pours salt and vinegar into the animal's ears, bores through the horn, injects the decoction there, and then, as if to balance up the account, cuts off a portion of the animal's tail and binds that up with pepper and salt. Internally he gives pork, which *perhaps* may be good as far as it goes, as the suspension of digestion never lets it get beyond the rumen, and all good it may do must be in the effect it may have on the food and the gases there. To make this more plain let me speak a little of the anatomy of the cow.

[The professor then gave a short explanation of the anatomy of the bones,

nervous and digestive apparatus, for a better understanding of what was to follow.]

I have been thus particular in the anatomy of these parts as they are the ones most affected, or are treated by those who seek to cure this malady.

It has long been a wonder how it could be that this disease was so severe, and why such unusual symptoms showed themselves. Some have accounted for it on the ground that there was congestion of the brain. Others that the fever, as they call it, has affected the senses and produced coma or delirium. This could hardly be the case, as recovery is almost as sudden as the attack, and again an examination shows that there is little beside the profound shock that the nervous system has received from the blocking of the organs of digestion.

We can scarcely conceive how such trouble can ensue, and why we have such serious consequences. A post-mortem examination shows that the rumen or paunch may be normal, or with a slight accumulation of gases; the reticulum (second stomach) will be in a normal condition; the omasum (third stomach) is found in a congested state, the many leaves or folds being filled in or impacted with food in a baked condition. In one case have I seen it so hard that a knife could scarcely sever it. The abomasum (fourth stomach), or true stomach, would be in a normal condition, but look as if there had been a sudden suspension of work. The organs of generation appear natural, or perhaps slightly inflamed and congested.

Nearly the whole trouble seems to arise from the stomach, and the pain and suffering appear to be so intense that the large nerve reaching this system is completely paralyzed, and those that reach the rear half of the animal. This gives a shock so great in some instances that all the nerves seem paralyzed, so that the animal cannot swallow and can only breathe with the greatest difficulty.

Many of you know what the result of a stomachic trouble is, especially that which is denominated as sick headache. The stomach is generally considered the seat of the trouble, but the brain, and indeed nearly every part of the system, sympathizes more or less. People have come to consider one afflicted in this way as a great sufferer; and indeed he is. The effect of sea-sickness on the brain, nervous system, and in fact the whole individual, is not very dissimilar. If, as has been said, our system when in health is like a harp of a thousand strings and all in perfect harmony, when in sea-sickness it is like music with a thousand discords; and any one who has experienced it in its fullest extent will have a very lucid remembrance of the little care he had for himself as to whether the boat sank or went on.

Causes.

Most of us are aware that wherever in the human system there is work performed, there is a corresponding determination or rush of blood to that part: there is also a large amount of nerve-force expended at that point, and there must be less to be expended at another. Persons riding in the cold, whip or rub the hands or stamp the feet to cause this increased flow of blood to those parts and produce the desired warmth. Persons, too, who wish to undergo severe trials of muscular exertion take only a limited supply of the light and easily-digested foods during such trials, for the reason that the nerve-force is nearly all utilized in the severe strain on the muscular system, and there is a smaller quantity left to aid digestion. "Too tired to eat" is a common expres-

sion with those who labor hard and long. After a short period of rest the circulation becomes equalized, and the digestive organs ask, by the sense of hunger, for what is needed to support the system.

The status of affairs is very similar in the case of the cow attacked by milk fever. She approaches the time for parturition full fed and with all the organs of digestion in a healthy and active state. The act takes place in the usual manner and with very little disturbance to the system, except the large expenditure of nervous and muscular force, which calls an extra supply of blood to the organs affected. Before the circulation is equalized, and with very little loss of blood, the appetite being vigorous, she partakes of a full meal. Indigestion ensues, and an entire blocking of the digestion by impaction of food in the third stomach or the omasum. The stomach becomes distended, and great pressure, together with inflammation of the parts, follows. When this pressure and inflammation is severe enough, the brain is affected by corresponding loss of blood, unconsciousness follows, together with paralysis of parts of the animal.

It may seem rather curious to some of you that pressure, or blows, or bruises on some particular parts will produce coma and paralysis. Fleming, in his work, in the chapter on parturient-apoplexy, says: "It is an indisputable fact that the functions of the brain are in a great measure dependent on the state of the circulation. A large array of physiological facts tend to show that a reduced flow of blood in this organ * * leads to lethargy, lessened reflex action, loss of volition and complete unconsciousness." "Now there is a general physiological law that organs cannot perform their functions without a sufficient supply of the vital fluid; and as the cerebrum is the seat of volition and of consciousness, these two functions are diminished in activity by sudden loss of blood, and if the deprivation is very considerable the brain entirely ceases to act." The paralysis, according to some authorities, may come from loss of volition and unconsciousness. A stoppage of the flow of blood to the brain may be caused in other ways. A case is given where a severe blow on the muzzle of a dog has caused contraction of the cerebral arteries, and the brain has suddenly been thus deprived of arterial blood, when unconsciousness and death followed. I might continue this part of the subject farther, but trust I have succeeded in making myself understood thus far.

Treatment.

As the stomach seems to be the seat of the disease, the first thing to be done is to give strong purgatives, 1½ to 2 pounds epsom salts, should be given as soon as the first symptoms are noticed. If not discovered until the animal has great difficulty in swallowing, great care should be exercised in giving the medicines lest they be taken into the trachea and thence into the lungs and the animal be choked, or inflammation and congestion be caused by the foreign substances taken into them. Belladonna extract or tincture aconite should be given in doses of from 10 to 20 drops, every half hour to one hour, according to the severity of the case. Give injections of tepid water in which a handful of salt is dissolved, in two gallons of water. This to be repeated every two to four hours. For outward treatment, rub the back and the region over the kidneys with alcohol or spirits of turpentine, as a counter irritant, and try to get up action of those parts. Chafing and rubbing the limbs from time to time to increase the circulation toward the extremities. If in cold weather blanket the animal warmly and keep the stall well littered with straw. Keep the animal lying in a natural position as nearly as possible and not too long on one side.

Change position every 4 to 6 hours. This treatment, if begun when the disease has not advanced more than two or three hours, perhaps will in a majority of cases cure. It is wonderful how rapidly the animal will recover after returning to consciousness. In the case of a Jersey cow treated in November, she began to show signs of returning consciousness at about 8 A. M., at 12.30 P. M. she was able to get up and stand upon her feet, although with some difficulty. Efforts to get up were made as early as 10.30 A. M. At 3 P. M. she was eating, and shortly after rumination began. For several hours she appeared dull and languid and did not eat readily or largely. Excretion, both liquid and solid, took place and the animal was, to all appearances, well, but looked haggard. At this date (Jan. 24) she is as well as any cow in our herd.

Prevention.

As there is so much difficulty in discovering the animal in time to bring the foregoing treatment to a successful issue we are reminded that "An ounce of prevention is worth a pound of cure." Hence if we can prevent the attack, it is much better than to cure it. As the trouble arises with the overloading of the stomach and consequent indigestion, or largely from that cause, then it would naturally follow that we can prevent this by depriving the animal of a portion of the food ration a few days before parturition is to take place.

This has been practiced in Great Britain, in France, and also in this country, with good success. In addition to the foregoing I would recommend the feeding of laxative mashes two or three times previous to the date when parturition is expected. In addition to this, shut the animal in a yard or stall where there is no straw litter, as the animal may conclude to gorge herself on this when she has been on short allowance for a week. This was the case with the last case we had in charge. The cow had been on half rations for 10 days and had feeds of turnips as a laxative. But when signs exhibited showed that parturition was near, she was turned loose into a box-stall well littered with oat straw. She at once gorged herself, and in 12 hours time was stricken with the disease. This disease would not seem so bad if it attacked and carried off only the poorer members of the herd. But when the destroyer comes and selects the fattest and best of the flock matters seem doubly worse.

A year ago I delivered a lecture before the farmers in several localities in this State on "The need of more veterinary science among farmers," when I found a strong desire for more light and education in the management of those diseases that are most common to our domestic animals. I sadly felt the need of more knowledge and experience in the management of our own herd. During the year I have made some progress in some directions, and have tried in this effort to give you some of the benefit of my investigation and study. Hoping that some parts of it may be of benefit to you, as it certainly has to me, I close, thanking you for your kind attention.

DISCUSSION.

Prof. Robert Jennings, V. S., was present, and on being called for, made the following remarks in regard to the treatment of Puerperal or Milk Fever:

This disease is one which our farmers should fully understand. Its fatality is due to neglect or ignorance in detecting the early symptoms of the disease. Careful observation will soon enable the farmer to determine at once its approach, in time to ward off the attack, or render it comparatively mild. "Prevention is better than cure." The old method of bleeding and purging

I for many years practiced, but, not satisfied with the results, it occurred to me that there was something wrong in the treatment, and as it was so fatal in its character, a few experiments would do no harm. I therefore commenced by combining stimulant and cathartic medicines as follows: To a pound of epsom salts I added one ounce of pulverized Jamaica ginger, mixed well together, and divided it into four powders, one to be given night and morning in a pint of warm water. In the interval of each dose, give a teaspoonful of the following liquid in a little water every three hours: Tincture of aconite, belladona, cinchonia, equal parts. As soon as the comatose condition passes off, tonics such as cascarrella bark, gentian root, etc., should be substituted for the aconite and belladonna. The spine should be stimulated by the application of hot sand bags or woollen cloths wrung out in hot water, or spirits of turpentine saturated with gum camphor, is a good application. I would advise, however, the consultation of a veterinary surgeon when reliable ones are to be found in the neighborhood.

In connection with this discussion, the following resolution was unanimously adopted:

Resolved, That it is the opinion of this Institute that the State Legislature should make provision for the establishment of a veterinary department at the Agricultural College.

AFTERNOON SESSION

Mrs. C. Gordon read the following essay:

THE FOUNDATION STONE.

Every nation of which history has given us any knowledge has had a foundation stone upon which it was built, or some central point around which it revolved, and upon which depended its very existence; and among the various causes that have united families until nations were formed, agriculture has performed an important part.

If in primitive times families and tribes united for protection, it was for the purpose of defending and preserving some cherished object or place around which clustered memories that were dear to them. With the union of families into nations would come strength, with power would come safety, and permanent homes would be built. The soil would be made to yield food for man, and when those products were for the benefit of the laborer, there would be an interchange of commodities. Commerce would spring into existence, which would be a benefit to the producer. With peace, protection, and prosperity to the tillers of the soil, the arts and sciences would be encouraged. For proof of this we need only look back over what has been done in our own State in the past fifty years, then nearly a desolate forest, inhabited by the wild man and beast. Now a net-work of railroads, telegraphs, and mail routes, with its shipping upon the lakes, its busy factories, its towns and cities teeming with energetic people, its schools dotting the State as the stars dot the firmament at night. Why this change in half a century? What was the foundation stone upon which it was built? Who and what were the men and women that made this change?

The majority of them were tillers of the soil. Their life was not only one

of labor, but, necessarily, often one of hardships. They sought the State when it was a wilderness, being protected in person and property, to make them a home where they could enjoy the fruits of their labor in safety. And those other improvements are the natural outgrowth of a prosperous agricultural people.

War may pass over a nation, lay its cities in ruins, destroy its internal improvements, change its form of government, and make sad the hearts of its people. If it at last leaves the pursuit of agriculture unoppressed, without a destructive taxation, it will soon renew its powers and restore its greatness.

Palestine once supported a large population, but for centuries their land was ravaged by the crusaders, death and destruction followed in their footsteps, and at the close agriculture was not protected, and to-day they are like the valley of dry bones seen by the prophets. Their ancient towns and cities are destroyed, their land is but a desert beneath the foot of the oppressor. They have removed the foundation stone and broken it in pieces.

This meeting is representative of the prosperity of an agricultural people. We are here, as tillers of the soil, to consider not only our present but our future condition; not in arrogance and pride, but in the spirit of candor and firmness; to do that which will not only be for our benefit but for the good of those who shall come after us.

The history of the past shows the necessity of laws as a rule of action enforced by the courts to govern and restrain the passions of man. Therefore would we ask at the hands of our legislators wise and judicious laws, not only for the farming community, that in their prosperity they may not forget the rights of others, but for the corporations throughout the country, that in their money getting it may not be oppressive upon the producers. We look upon them as a necessity to our prosperity, and our prosperity is for their benefit.

And may the intelligence of the people in the future be such that if man, to expend his surplus energies, has to make war and meet upon the field of battle, that they may say to the military, touch not the internal improvements nor the interests of the producer, for with these two a nation's damages can be restored. Societies, social as well as political, require a basis more or less stable upon which to erect their structure, and to-day what are the elements principally composing such foundations. Do we find intellect, the moulding of which would not only add beauty but strength to the union? Is virtue combined so plainly as a part that in order to enter such societies and stand securely upon its foundation all material must have an affinity for the same, not only would it be necessary for the class deemed the weaker but essentially so for the stronger. Does morality and enduring substance, but many times not easily obtained, rank as one of the first in the combination?

If these unite, forming the compound called the foundation stone, then societies formed upon such a basis would be alike beneficial to the purchaser and consumer and as lasting as the rock upon which they are built.

If we would see a beautiful State, we have only to look around us, then can we truly say our homes have fallen in pleasant places, where we have the privilege not only of thinking but of expressing our thoughts; where we labor and enjoy the fruits of our labor, and have learned to respect the rights of others.

Mr. Bacheler, of Osceola, read the following essay on

THEORY AND PRACTICE AS APPLIED TO FARMING.

In discussing this question we shall recognize theory and practice as inseparable. No husbandman of thought will discard the one or the other.

Practice is necessary *always* and *true* theory should never be cast aside.

We say "true theory" because it comes to us in various forms. First: we have a visionary kind which can never be relied upon, being speculative in its nature and not practical. We see it on every hand; it appears in every form and phase.

Scarcely a person one meets, if interrogated upon a familiar question, but has some theory to present, much of which is this visionary sort. Not that they are desirous of advocating that which is untrue, but being ready to impart information at all times, their ideas, though apparently logical—and believed by themselves—often vary from those brought to light from a practical application.

Take any of our farm journals, scan their pages, and then attempt to apply what is often taught and see what per cent is practical, and I venture to say you will be astonished with the result.

Now we do not wish to be understood as undervaluing our agricultural journals, for we deem them of importance, and a necessary requisite to the farm, but it is with reference to articles furnished by those theoretical hobbyists we speak, who are ever ready through the press and otherwise to force their ideas upon the public, often taking subjects with which they have had no practical experience, devoting their entire energies and ingenuity to advocating the same, and often, were the farmer to act in accordance with the theory advanced, it would result in great damage to the stock or crops, as the case might be.

He has this to contend with at all times, and should he desire information on any subject it requires a great amount of sorting and sifting to obtain what he wishes; for if raising stock or crops, applying fertilizers, etc., be the object he knows he has to deal with agencies whose laws are fixed and unvarying, and to obtain just what he desires must understand, from practical experience, what to expect should a certain course be followed.

This class of theorists is not found among the illiterate alone, but quite as often among those who are regarded as educators of this branch of science. Constant study of some pet question leads them so far in a certain direction that the theory, as a whole, becomes entirely impracticable to the farming community.

We have another class of theory which may be regarded as lying between the false and true.

It will often be found from practical experience, upon a small scale, that certain kinds of business can be successfully engaged in which, if enlarged upon, proves a failure.

For instance, some poultry fancier, with from twelve to twenty fowls of some choice breed, finds that by certain care they can be made profitable, and from this standpoint reasons. He shows up the capital invested, the feed required, the expense of caring for same, etc., and finds on striking the balance that a nice profit has been realized, and sees no reason why an extensive business cannot be made profitable, and gives his advice as to the course to be followed. Some enthusiast catches at the idea, and, without mature thought and a thorough investigation of the subject himself, he at once branches out and at a

large expense prepares for the business. Perhaps one or two thousand birds are procured, yard fenced, buildings erected, and every convenience arranged for their comfort, all upon the most scientific plan known. Poultry journals are subscribed for and read, the latest devices and theories noted and put in practice, and it would seem to the casual observer that success was unquestionable. But alas! The harvest of golden eggs does not meet the expectation, and the chicks do not thrive and mature as did those of our theorist's dozen. The delicacies that were obtained in their rambles, which are necessary to warrant health and a bountiful supply of eggs, are lessened in proportion to the number kept. Disease, unaccounted for, makes its appearance, and the yard so carefully arranged becomes but a hospital of sick birds and the project a failure, and why? As intimated above, simply because the business was of a nature that beyond a certain limit other circumstances intervened which entirely destroyed the prospects of success.

What is true in this case may be claimed in many others. And right here is where many of our theorists and experimenters err. It is not always a true criterion to follow, that because some one animal by proper care and feed can be made profitable, *all* can, and that a large herd can be made proportionately so. It would be strange indeed if they were all bred, formed, and constituted alike, which must necessarily be considered if an equal return for the same feed be obtained.

And the same may be said in relation to crops. It is not an absolute certainty that because a few rods of ground in some locality can be made to show certain results, that the broad acres will at all times verify the same fact. Season, climate, soil, and many other circumstances we cannot account for, will all affect the result.

Then, too, the experimenter is very apt to select, if an animal, one that will take feed to the best advantage; and if land, that which is most productive; that the result may be the more astonishing to the outside observer.

The reverse of the above is quite as often met with. Much of the theory, though it may be true, is entirely out of reach—financially—of the majority of farmers.

For example, we are told that food properly cooked for stock to be fattened is of great advantage in many ways: the amount consumed is very much lessened, and the animal brought to maturity much earlier and in a more ripe, complete state; hence the quick, large gains in weight and the enhanced value at sale, in connection with the much-lessened amount of food required, would not only make the business profitable, but one of advantage for any to follow:

Now is this true? Will our farms, ranging from 40 to 300 acres, admit of the outlay necessary to follow out this line of reasoning? From $1,000 to $1,500 would be required to make it in any sense a success, and farmers of ordinary means could not safely make the investment. Perhaps, with plenty of money at hand and a farm of sufficient range, it might be made profitable, but with the majority it is wholly impracticable.

Thus we will see that most of our theory sounds well and is interesting to talk about in the "club room," or a subject upon which long papers may be read, that are often more fitted to astonish than benefit the listener. But among all this we have theory that is true, which, like the particles of gold that are thrown from the earth, require practical experience to separate and utilize.

Very often the real benefit is lost by the farmer not knowing when or how

to make the application, or in other words, not being acquainted and understanding the requirements of his own farm. For instance, deep plowing is advocated as highly important; which is true, if properly managed. It brings to the surface elements heretofore undisturbed, that have never been drawn by crops, and forms a bed in which plants may root deep, enabling them to better stand the dry weather that may now be regarded as periodical. But it requires a certain amount of experience and common sense to know when and under what circumstances to practice it.

Here, for example, is a farmer ready to commence his spring plowing. He picks up some work on agriculture, and his attention is directed to that subject. The writer scientifically shows the great advantage in bringing to the surface the various elements that have so long lain dormant, and chemically explains their importance as food for nourishment of the plant, and forcibly demonstrates the loss sustained by the husbandman in skimming over the surface of his farm year after year. He at once becomes convinced of his error, and that he has an inheritance of unlimited depth as well as many acres in breadth.

Heretofore he has been turning the soil but six inches in depth, and is quite out of sorts with himself that he should have given so little thought to the subject. He at once cautions his plowman that the furrow must now be put down to at least ten inches.

The directions are heeded and the ground, which is a heavy clay, is prepared for the seed. Oats and barley are sown, and our enthusiast rejoices in the hope of a greatly increased crop, and, it is not necessary to state, hopes in vain; the yield instead of being increased, is much reduced, and, perhaps, an entire failure, and the farmer thoroughly disgusted with deep plowing. He had not, by experience or further investigation of the subject, learned that such soil required an exposure to the sun, atmosphere and frosts before it could be made productive.

Again, should he desire to engage in wool-growing and sheep breeding, having had no previous experience, he would find himself a very inefficient judge to select animals for that purpose, even though much theoretical study had been given to the subject, and, should a purchase be made, he would quite likely learn, in after years, he had been sadly duped, and that he had on his hands just what he did not desire.

Theory will, in a great measure, set forth the requirements, but years of experience are necessary to make one an adept at the business. The eye must become educated by comparison and practice, for no amount of theorizing can accomplish the work, and even after having spent a lifetime in close thought and study, there will be much yet to learn.

The improvement in breeding animals often changes them constitutionally, and therefore new diseases make their appearance, which baffle the skill of the most experienced.

Climatic changes from heat to cold, or wet to dry has its effect upon both crops and animals, and the result is, unlooked for changes often make their appearance, and unnumbered little events are brought to the surface, that theory cannot account for or explain.

The farmer has to deal with natural laws; therefore his life should be one of ceaseless study, and the nearer he approaches to a perfect understanding of her laws, and practices accordingly, the more complete will be his success.

Prof. C. L. Ingersoll gave a lecture on "Beef Breeds of Cattle." (See lectures given at more than one institute.)

Hon. Wm. Ball, of Hamburg, read the following essay on

SHEEP RAISING AND WOOL GROWING.

Mr. President and fellow farmers: The committee to whom was assigned the duty of preparing a programme for this institute instructed me to prepare a paper upon the subject of "Sheep breeding and wool growing." The subject is one of so great importance to every farmer engaged in raising sheep that it should have been placed in abler hands than mine, that it might receive such intelligent treatment as its character demands. Sheep breeding and wool growing are somewhat divisible in their nature, though closely connected, as without the sheep we could not produce the wool, nor without the wool would it be desirable to produce the sheep, but a combination of both is worthy of all the attention and study that can be given to it. How to perfect the form, giving it size, constitution, physical vigor, while at the same time producing a fleece that shall pay the producer and satisfy the manufacturer, is a problem that is in process of solution by scores of men all over the country; and when we compare the results as they appear to-day with those of fifty years ago the comparison is highly favorable. For the long, slim necked, high horned, bare-faced, long bare-legged, thin fleeced Spanish merino of 1812, we have the short, heavy folded neck, the nicely turned horn, well covered face, short, well covered legs, thick, heavy fleeced American merino of to-day. Instead of the two and half pound fleece of that day we have fleeces ranging anywhere from ten to thirty (and even more) pounds of wool. A very creditable showing. And while from the common flocks of the country at that time, and even many years later, the clip of wool would average from two to three pounds per head, the grade flock of to-day that will not average from five and one-half to seven pounds of well-washed wool is not considered a profitable flock to keep.

These facts, to the thinking farmer, suggest the inquiry: How have these improvements in the general character and form of the sheep and the large increase in the amount of wool been obtained? The answer is patent to every observing man. It is the result of close thought, study, care, and the determination of men who have been engaged in this branch of business to bring it to its highest state of perfection of which it is susceptible, as well as attention to nature's laws, a knowledge of the wants and requirements of the animals bred, together with a close comparison of results. This question also presents itself: If, in so few years, so much worth has been added to this noble creature, why in a like number of years, or even less, may not even greater improvements be made? When perfection has been obtained, and man has filled his mission in this experimental world, then perhaps he will be excused from further trial, but so long as so much remains to be accomplished his motto should be onward and upward. It is said, and justly to, that "the man who causes two blades of grass to grow where only one grew before is a public benefactor," and certainly the man who can cause two or three pounds of wool to grow where only one was produced before is still a greater one. The large increase in quality and quantity of wool now produced by the common flocks of our State is very largely due to the use of thoroughbred American Merino rams, and those that have done the most good are those which have been bred with the greatest care, whose ancestry traces directly back to one of the two great families of the Spanish importations known as the Paular and Infantado. At the present time a good many men are investing money in fine wooled sheep. No man should buy sheep as thoroughbred without a pedigree, one that is already re-

corded, or for a certainty will be recorded, making this a condition in the purchase.

The time is not coming but is now that men cannot afford to invest their money in sheep which are called full blood. As in cattle so in sheep. No sane man will pay the price of pedigreed cattle, or those recorded, for those that cannot be recorded, and why should he for sheep? In this as in all other branches of business, some will make it a success while others will not.

Almost any man who will take good care of his flock and buy, when needed, a good male, can raise a good, profitable flock of sheep, for wool and mutton, but the same plans will not meet with the same general good results in the thoroughbred. Improvement is the watchword, and it is a much harder task to improve upon that which is already very good than upon that which is not so good. With a strong-bred flock of ewes it requires a much stronger bred male to make the coveted improvement. And right here is one of the great difficulties, the scarcity of strongbred males, those which have great prepotency or power of transmission of desirable qualities. No man who invests his means in thoroughbred sheep should for a moment think his task done when he has secured his flock. He is just getting into trouble, and to extricate himself and make his investment profitable and honorable, he should inform himself upon the history of his flock, their general character, how they had been bred, and what is needed to produce the desirable improvement, and then secure it, if possible, either by purchase or hire. If a mechanic or inventor wishes to construct a steam engine, he must first have in his mind a model, perfect in all its parts, must see it in motion, know just where a cylinder should be placed, where a wheel should be located, a burr fastened, how much steam it will bear, what its capacity should be, and then go to work and apply the means to secure his object. Just so with the breeder of sheep. He should have in his mind his model, such a sheep as suits him, and then try and breed it. If he fails once or a dozen times, he is only repeating the experience of all those who have tried the same thing; and he has this to comfort him, he is all the time learning, by his mistakes as well as his successes, and, with perseverance and good judgment, he will in time succeed. And right here this thought presents itself, that in sheep breeding, as in many other pursuits, fashion has something to do with our models.

If the demand is for the largest amount of wool to the least weight of carcass, some will work in that direction, and in fact, not many years since such, to quite an extent, was the practice. But as wool was obtained at the expense of constitution, size and physical power, the practice was discontinued, and now it would seem to be, how much size, constitution, wool and other desirable qualities can be combined in one sheep. A very good idea, I think, as one strong trait of the Yankee is to see, at the end of all breeding or working, the coveted reward in dollars and cents as well as honor and renown.

To-day, if the demand is for long, light fleeced wool, and some of the solons engaged in buying our wool say it is, many are striving to satisfy the call, and, to some extent, the demand is for a long, dry, white staple of wool in stock rams, and some breeders are trying to comply with such demand, knowing that they do so at the expense of thickness of fleece, shortness of legs and the stylish form of a true Merino, and many other qualities which go to make a good sheep. The purchaser of such stock sheep can, in a few years, get what he sought after, but he has secured it by the loss of a pound or two of wool per head, besides injuring his flock in many other directions.

One of the first requisites in a stock ram should be pedigree. There should

be no mistake about this, and hence the necessity of dealing with men whose honor is well established rather than believe the stories of a class of sheep peddlers who infest our State yearly with a fixed up lot of pedigrees, and sheep which, when bought, sheared and kept here never again present so good an appearance as when purchased. Buyers have no remedy. The peddlers are gone, and even should they be here not many are responsible. Were I to describe a desirable ram it would be something as follows: First pedigree, Should want him so bred and his character so firmly established by type or line breeding that he should be able to impart and stamp his good qualities surely on his offspring. 2d. He should be of good size, weighing when matured and in good condition, from 130 to 150 pounds. He should have a short, broad, clear-colored nose, with a large wrinkle or more crossing it above the nostrils, which should be open and large, thick, small velvety ears, free from tan marks, a smooth, fine, well turned horn, the head well covered with wool, and I do not care if the face is also covered. Short neck with heavy folds, especially on the underside, supported by a strong broad pair of shoulders, legs large boned, short and well covered, a good, broad, strong loin, smoothly connected with a broad pair of hips, a little sloping perhaps, broad, heavy tail, with heavy wrinkles, heavy flank, with a straight hindleg. The body should be compact, deep and round, with a few heavy folds extending towards the belly, well filled behind the forward leg, also inside the hind leg, couplings good, the whole body covered with a very strong, dense fleece of wool two and one-half inches long, the tinge rather tending to the buff color. If some jars appear on the folds would not object, but would prefer not to have them upon the body. The fleece at a year's growth should weigh in the dirt 25 pounds or upwards. I do not in a ram's fleece like too much of the white appearance, as my experience has satisfied me that the tendency is toward fineness and thinness. With such a stock ram breeders need have little fear of the result.

It is said by some that the merino ewe is not a good breeder. This is a mistake, if she be properly handled and fed. Breeding ewes need a change of food, with plenty of exercise. Wheat straw, cornstalks, marsh hay and clover hay, all in turn, are good for them, and a small amount of grain should be given if needed. Good clear water is also a necessity.

Every flock of breeding ewes should be driven a certain distance every day, and particularly so, shortly before lambing. One theory of the cause of goiter in lambs is from a lack of exercise of their dams. The experience of some breeders is that a large percentage of lambs which are troubled with this malady (and it agrees with my own experience) are those which are dropped in the latter part of the lambing season, attributing it to a less amount of exercise at this time of the year than preceding it.

That wool-growing to the farmer of to-day is one of the substantial means of prosperity, no one for a moment denies. That it has proved remunerative in the past, plenty of proof-positive can easily be found. As a matter of history, I have appended a list of prices of wool, which was prepared by a gentleman in Boston, taking Ohio wool as a basis and covering a period of fifty years, commencing in 1827 and including 1876. The prices are made on a gold basis. The lowest price was in 1843, being 30¼ cents per pound. The highest price was in 1831, being 60⅓ cents per pound. The average price for the fifty years is 43 67-100 cents per pound. From this, deduct commissions, freight, the difference between Ohio and Michigan wools, and the average for our wools would be about 35 cents per pound.

YEAR.	PRICE (cents).	YEAR.	PRICE (cents).	YEAR.	PRICE (cents).
1827	33.33	1844	37.00	1861	40.58
1828	36.83	1845	36.25	1862	40.08
1829	37.42	1846	32.58	1863	50.90
1830	46.00	1847	39.00	1864	45.98
1831	60.33	1848	33.75	1865	51.65
1832	49.66	1849	34.35	1866	43.41
1833	54.00	1850	38.92	1867	37.51
1834	53.63	1851	40.73	1868	32.88
1835	54.55	1852	40.33	1869	34.33
1836	58.00	1853	53.67	1870	40.33
1837	56.33	1854	43.00	1871	48.02
1838	41.32	1855	39.08	1872	61.77
1839	49.66	1856	46.33	1873	48.05
1840	41.00	1857	45.66	1874	48.02
1841	43.25	1858	40.00	1875	43.32
1842	37.75	1859	48.17	1876	38.32
1843	30.25	1860	47.25		

For the past two years, and particularly the last year, with all kinds of business depressed, grain, beef, and pork very low, wool and mutton have brought remunerative prices. What the actual cost is of producing a pound of wool or mutton, very few farmers know. Circumstances have much to do with the cost of production. If from one farm, two tons of hay can be cut per acre, and upon another only one can be secured, with grain and grass in like proportion, the cost of a pound of wool or a pound of mutton will be twice as much upon one farm as the other, other things being equal. If A has a flock of sheep that shears six pounds of wool per head, and B has a flock that shears four pounds per head, it does not cost A but two-thirds as much as it does B to produce the same amount.

Good grade ewes that can be bought for twenty shillings or three dollars per head, well kept, will shear six pounds of washed wool per head, and with ordinary luck raise a lamb. With wool at thirty cents per pound, and good sheep bringing the price they do, it requires no very great skill to discover that sheep and wool raising pay. If then it be admitted that raising sheep for wool and mutton pays, it is of the highest importance what kind or breeds of sheep the farmers should raise. In this matter the intelligent breeder will study the peculiarities of his soil, location to market, and the number he can keep, whether he will be obliged to keep many together, or more separately, whether his feed is abundant and nutritious, or not so plenty and less rich. He must study well his surroundings and then choose accordingly. From what knowledge I have of this county, and I have repeatedly been over all of it, I am satisfied that for wool and mutton combined, taking into account the soil, climate, and conveniences for keeping, that the grade merino is by far the best sheep.

All sheep, like other kinds of farm stock, are more or less profitable as they are well bred and well kept or poorly bred and poorly kept, and very much of the good results in breeding and getting large clips of wool, strong carcasses for mutton is due to liberal feeding and judicious care and protection from the rigors of our sometimes severe winters.

In these days of disaster and ruin, in many kinds of business it is necessary that the farmer should study economy in his farm account, and he can do so

in no way so effectually as by making every acre of his farm produce as much as possible. Where there are waste places, subdue them; where nothing grew, grow something; if wet, underdrain; if poor, enrich it. And in no way can this be so cheaply and profitably be done as with a certain number of good, well-kept sheep. In breeding no grade ram should be used, however good he may appear or however much he may shear, for there is no certainty in what he may get. If grades will answer then thoroughbreeding is practically a failure.

All writers on the subject of breeding, no matter whether cattle, horses, sheep, or any other stock, advocate the use of thoroughbred males, and practice and experience prove the soundness of the theory. The time is not now when sheep have arrived at that state of perfection and profit that they need no more improvement. It is not too much to say that in the course of a few years it will be as common to shear an average of eight or ten pounds of washed wool per head as it is now to shear six or seven, and wool worth as much per pound. We must breed to gradually increase size of carcass, thickness of staple, and have all parts of the sheep covered. By the way some sheep are kept, it would look as though the notion that "something could come of nothing by the gracious aid of sheep," is still believed in, and I cannot make my ideas any plainer than by quoting the remarks of a practical sheep breeder, who says: "We frequently see absurd statements that the sheep's foot turns all to gold, and there is no steadier or surer way to fertilize a barren field than to put a flock of sheep to pasture upon the briars and weeds in it; that, in effect, sheep will live upon the poorest food and make the richest manure, and thus the very best stock a farmer can keep on his farm. But those who have been there know better. * * There is no other domestic animal that needs better care or food for profitable thrift than sheep; that out of their finely-grinding manure mill comes nothing that is not first put into the hopper; that yet, with proper care and skill, a well selected flock of the right kind of sheep, in the right place, can be made to pay one hundred per cent on their cost every year. It is true that a flock of sheep will clear a field of weeds, briars, and rubbish, and will enrich it, but it will not live upon these. To relish this rough herbage, the sheep must be fed liberally with some supplementary food, such as bran, cut clover, grass, or green cornfodder, or some grain food. Then with this alloy the sheep's foot may take on the golden tinge and will edge with gold the farmer's pocket by making his poor lands rich; giving him, at the same time, a lamb or two and a fleece every year. The fact is, sheep are manure spreaders rather than manure makers. We feed them with the material, they take their pay out of it and give us back the remainder, transformed into a substance of equal value (because it is more available), with that which they receive, and they get fat meanwhile in doing it. Just as we give the mint a bag of gold dust and we get back exactly the same weight of gold dollars while the coiners are fed upon it, but without the dust we get no dollars. So with sheep. If we do not feed them with the materials needed to make fat for themselves and rich manure for us they will prove as unprofitable as Pharaoh's lean kine."

Connected with sheep-breeding and wool-growing is sheep-washing. The practice of putting sheep into the water for the purpose of cleansing the wool is of doubtful expediency, and open to serious objections. The practice is cruel, both to men and sheep, besides being dangerous to health. Nature has so adapted herself that proper covering is provided for the different animals in different latitudes and climates. In the more southern and warmer portions

the covering of animals is thinner than in the colder and more northern localities. Reasoning, then, from this, it would seem that more wool could be produced, that its growth would be stimulated, by shearing early in the spring or by the first of May, while cool weather exists. Nature would interpose herself here, and try to make good the comfort and warmth by quickly covering the exposed body of the sheep; and more wool is yearly produced than if the month of May was left to finish up the year's growth of the fleece.

By this early shearing we can get more wool yearly, the comfort and health of the sheep be promoted; besides the loss and trouble from flies and maggots are avoided. No observing flock-master could have failed to notice the discomfort of heavy-fleeced sheep through the warm days of last April, and the remedy is to shear early enough in the season to escape the difficulty. Again, the appearance of wool is injured by this pulling and squeezing in washing, and the indifferent manner in which this part of the work is done is injurious to the real merit of our wool. I have had experience in both methods of putting up wool, and I am clearly of the opinion that, all things considered, the washing of sheep is unprofitable and should be discouraged.

Mr. President, I have tried to confine my remarks to the subject assigned me, and if they will be the means of bringing out thought and discussion on points where differences of opinion will occur, or if they shall awaken a greater interest in this the profitable branch of farming of to-day, and cause men to study the economy of raising better sheep, of keeping and caring for them better, I shall have accomplished all or even more than I anticipated.

EVENING SESSION.

Mr. W. Asa Rowe read the following paper on the

SWAMP LANDS OF MICHIGAN.

There are in Michigan about three and a half millions of acres of State swamp lands, and in the older part of the State—the four southern tiers of counties—there are nearly three hundred thousand acres of this class of lands. Of course these State swamp lands are *not all wet;* yet there are are also some really wet lands not included by them, so that they probably represent very fairly the actual amount of this class of lands in the State. In some portions of the State, one-third of the farms have more or less of these water-soaked, health-destroying lands within their borders.

Having so much at stake, all the residents of our State should be interested in their reclamation. The simple question of good health ought to be sufficient to claim the attention even of those who have none of this land. Good health is the greatest boon that can be conferred on any person; without it life, even with wealth, is miserable; while with it life may be enjoyed even in poverty. That these swamp lands are injurious to the health of all persons living in their vicinity, is admitted by all who have given the subject attention.

The malarial diseases caused by these lands early gave our State a very undesirable reputation. Doubtless most of you will recollect the report at an early day of the Surveyor General to the government in regard to the lands within our borders. The report was that the lands, being nothing but sand-ridges and

marshes, were *worthless* and unfit for settlement on account of fever and ague and other diseases of like nature. Indeed, most of you know that to come here to stay was formerly equivalent to accepting a season's siege of the same disease.

This form of disease is not now of nearly as frequent occurrence as formerly, owing to the drainage of many of the larger swamps. There may be, doubtless are, many defects in our present drain laws, but do not oppose them on this ground. They have accomplished too much good to be thrown away; rather point out and assist to remedy these defects.

Thus far I have spoken only of the influence of these lands on health, because *that* was of the *highest importance*, and yet the most likely to be overlooked.

There is, however, another point from which we must look at these lands. The first thought of the average farmer when approached in regard to ditching these lands is, will it pay? If we are to lay aside the question of good health as a portion of the capital of a community, and consider only the finances of the individual owner, the answer to the foregoing question will vary with surrounding circumstances. These circumstances are,—

1st. The nature and value of surrounding upland.

2d. The nature of the swamp itself and the cost of draining and reclaiming it.

3d. The extent and position of these lands when taken in connection with other lands owned by the same individual, and the crops most profitably grown.

With good hard land for what the first cost of ditching would be, and with wheat for the chief money crop, as was the case here at an early day, and still is the case in many parts of the state, it is financial folly to drain the swamps; but with upland cleared up and impoverished, though valued at a high figure, with money plenty and seeking investment at reasonable rates of interest, and with good markets for the products of mixed husbandry, as is the case in the older parts of the State, the capitalist will do well to carefully consider these lands before seeking investment for his money elsewhere.

In considering this subject we must understand that *these swamp lands vary in character* as much as upland, and every farmer knows how much that is. Some of them have only to be rid of the surplus water and cleared to be capable of growing almost any crop, while others may be adapted only to growing special crops, and still others may not grow anything for several years, or even not at all until dressed with sand, clay, lime, or other substance. So that not only must the cost of draining and clearing be taken into consideration, but their quality and productiveness after they are so reclaimed, and this must largely be learned by experience and observation. The swamp that will not produce some crop soon after it is drained is very rare indeed.

In all swamp lands good drainage develops unexpected peculiarities. The sponge-like peat with its water drawn off, settles down and develops ridges here and there all over its surface, showing where the subsoil approaches near to the surface. Judging from observations, I should say that on at least one-third of these swamp lands a plow would, after a few years' drainage, reach down through the muck and bring up the subsoil from below.

Where, however, the muck is deep on the surface, and where it has received no admixture of soil, either from the overflow of streams or the wash of the surrounding country, the land will neither produce so large a variety of crops nor so much of them as where it has some other soil mixed with it.

The fact is *pure peat* is deficient in plant food. This may be remedied by a topdressing of some kind, such as sand, clay, lime, or even barnyard manure.

The value of such topdressings are fully understood among the farmers of Great Britain, where none of this class of land is reclaimed without the addition of sand, lime, clay, or manures of various kinds, and sometimes all of them are used. With us, however, the value of such topdressings is not appreciated or understood. Their value may be easily learned from experiments on a small scale.

Swamp lands vary greatly in the cost of drainage, some being very easily drained, merely requiring a good outlet and drains to catch the water that comes down on them from the surrounding upland, while others having a hard and impervious subsoil near the surface, require frequent drains over the entire surface. Springy swamps are usually the most difficult to drain well, as it is necessary to so cut the ditches as to tap the stream of water before it reaches the surface, and this requires some skill and experience.

The nature of the vegetation growing on a swamp will have considerable influence on the cost of reclamation.

With our present drain laws many swamps are ditched and then left without any further attempt at rendering them productive, the owners supposing that they being rid of their surplus water will, like new cleared upland, soon produce good pasture without seeding. This is a mistake; the old marsh vegetation is firmly rooted, and though the drained land is not well suited to its growth, it hangs on and is replaced very slowly or not at all by better feed.

Now if we are to expend *any money at all* on these lands the only way to get it back is to keep working at them till they will grow good crops of some kind. Cut off the brush and break up the wild grass sod and get good tame grasses growing.

The most of our swamp lands, when properly ditched and cleared, are especially adapted to grazing and the production of hay, and for this reason are usually more profitable when owned and farmed in connection with adjoining upland; this is especially the case where mixed farming is followed.

Again, the closer and more compact a farm is the cheaper it can be worked. In other words, it may be more profitable to reclaim and work a swamp than to go around and beyond this swamp to purchase upland, because the upland is farther away from the buildings.

The cost of fencing must also be considered in looking at this subject, especially if the swamp is already on the farm. So long as the swamp is unproductive the adjoining cultivated field must bear the whole cost of the fence between them; when the swamp is cleared, we increase the productive area of the farm without much increase of fence, and thereby reduce the cost per acre of fencing the farm.

With these brief remarks I will close, saying only that I believe these lands, as a whole, offer surplus capital a good chance for investment, with sure and profitable returns; but these returns will vary greatly with the skill and judgment of the investor in buying and reclaiming them.

A number of topics were discussed in a general way at this session, and essays were read by Mr. S. B. Persons and Mrs. W. K. Sexton, the first on "Our Responsibilities," the second on "The Farmer: His Position and Duty." We have not the manuscripts of these essays and consequently are unable to publish them. Prof. Ingersoll also gave a short talk on Dairy Breeds of Cattle and Yields of Milk. After a vote of thanks to the members of the College Faculty and others who had taken part in the exercises the Institute was declared adjourned.

CENTREVILLE INSTITUTE.

The Institute held at Centreville, commencing January 23d, was regarded by all who attended it as one of the most interesting and successful of the series. The attendance was large, and those attending manifested a degree of interest amounting almost to enthusiasm in the exercises of the meeting.

Each session was opened by music and prayer. At the commencement of the first evening session the President, Mr. J. H. Gardner, gave the following

OPENING ADDRESS.

FARMERS AND FRIENDS:—We are gratified to see so many here to take part in this, the first Institute for the benefit of farmers ever held in this county. The object of the Institute is to bring together science and practice, in lectures and discussions on subjects relating to the management of the farm.

The old year is past and gone; we have entered now on a new year. Let us endeavor to avoid our past errors, and strive to improve for the future by forethought and industry; let us receive instruction from science, that it may be applied in practice by a better understanding of nature's laws. We all should heed any suggestion of our friends that will increase the yield of our crops or our stock, or lessen the cost of production. We also should learn the elements of our soils, and the habits and changes of the insects that prey upon our crops, orchards and gardens.

How shall we cultivate our farms so that the production can be increased at a profit? is an important question to all; not only to the farmer and his family, but to the mechanic, the merchant, and all classes of community; for when there is a failure of the crops, all business comes to a stand and suffers equally with farmers. Therefore it behooves us to learn the best and most profitable methods of production, by increasing the fertility of the soil and yield of our fields. Guess-work in farming seldom pays; nature's laws must be observed if success is gained, and the farmer who understands his business best is the most successful.

Much has been said about the capital invested in banking, which is a little more than three hundred million dollars; but that is a less sum than the value of the wheat crop of our country for a single season; and if all the banks in the United States were wiped out at once, the loss would not be as great as of a crop of wheat. By this, an idea of the value of the productions of the soil can be had when all are taken together.

The committee on arrangement of the programme have endeavored to present a variety of subjects which are important in their relation to the prosperity of farmers. These will be responded to by those who are qualified to give instruction from experience. Discussion of the several subjects is invited. To you, farmers, we expect advantages to result from the instruction here offered, and hope that profit will come to you from this teaching. Treasure it up, that it may be drawn upon and put in practice on your farms in the future.

We have with us the President and several professors of our Agricultural College, who have made a study of agriculture both in theory and practice, who will lecture on subjects connected therewith. Gentlemen of our Agricultural

College, we ask you for advice and counsel, and trust that all will heed and profit by it.

For the farmers and citizens of St. Joseph county, I bid you welcome; and also welcome our visitors, and invite them to take part in the discussions of the Institute.

Mr. James Cassidy, gardener at the Agricultural College, read the following essay on

HOUSEHOLD HORTICULTURE.

It is with pleasure we note the steady progress of the different branches of horticulture in public favor, as a means of profit, education, and recreation, particularly floriculture, about the merits of which, as a useful, instructive, and ornamental art, there can be no two opinions. That this department of horticulture is becoming very popalar and profitable is evident from the fact that the materials employed therein form a considerable branch of commercial traffic. But although it is thus widely extended, there is yet room for a much wider extension. There are thousands who have no plants in their windows, and thousands more whose plants exhibit nothing but leafless stems projecting from their pots on the window-sill. Our objects are two-fold: first to persuade those who don't grow plants in their windows to begin at once; we promise them a pleasure and gratification from it that will amply repay them; and secondly, to show how this can be cecomplished. Those who are practically unacquainted with plant growing had better begin with a small stock, as it is far better to possess a half dozen healthy plants than a host of miserable objects that are neither use nor ornament. The vexation and disappointment many experience through attempting too much frequently induces them to abandon flowers altogether. Had they commenced with two or three kinds of easy culture, success would have increased their love of the art and induced them to add to their stock with increased knowledge until they derived pleasure and gratification from it themselves, while setting a good example to others. We will first notice the operations necessary to success, merely premising that as the objects of our care are growing existences, as distinguished from unorganized matter, profitable results will be in proportion to our careful attention to their varied wants. Cleanliness is as essential to health in the vegetable as in the animal kingdom, and in some respects, perhaps, more so. Every plant being an organized existence, its health largely depends on its ability to perform its natural functions—analogous to perspiration, respiration, and digestion in the animal economy. Remembering this, we see at once how much they suffer when covered with dust and the excretions of insects. As frequent washings are thus promotive of health, so frequent sprinklings over the foliage of most plants will act as the great antidote to disease, insects, and decay. The insects and disease that infest, and not unfrequently destroy plants, may be kept at bay to a considerable extent by good cultivation, which consists in providing at every stage of the life of a plant conditions favorable to its full development in any form desired. As a rule, the appearance of insects, or mildew, is an evidence of debility in the plant, induced very frequently by neglect of the ordinary rules of cultivation. The best remedial agents are air, water, and light; but in aid of these we are sometimes compelled to employ tobacco, soap, sulphur, or patent preparations, made of no one knows what. A slight dusting of tobacco powder will generally remove green fly without injury to the leaves, dusted. The little mite called "red spider" always appears where plants are

kept too hot and too dry, and is always known to be present by the leaves having a pale, spotted appearance. Hence, atmospheric moisture, obtained by sprinkling the foliage with water, will generally dispose of them.

Ventilation.

Whatever plants we cultivate, the more healthy they will be in proportion to the fresh air they receive. Those are the most dependent on this change of air which receive least sunshine, because in sunshine the plant, to a certain extent, purifies its own atmosphere. Air giving, however, must be dependent on human comfort, as well as the welfare of plants, and should only be given when air above freezing can be admitted, and be careful to avoid draughts. When people talk of dry air being injurious to plants, they really mean impure air; air is seldom too dry.

Shading.

It is seldom necessary to shade a plant out of doors, but it is sometimes desirable to shade plants in windows. There, for instance, is a fresh potted plant, perhaps partially disrooted a week ago; the weather has been dull ever since; but to-day the sun shines brightly, and water as you will every leaf wilts; there are greater demands made upon the leaves than the roots can, in their torpid state, properly meet; and in such a case, when the soil is wet enough, instead of deluging it with more water, the proper plan to adopt is shading, and sprinkling the foliage with water until the reciprocal action between roots and leaves is restored. But another evil is sometimes induced by continuing the shade longer than is necessary. Plants lengthen in heat, but increase only in unobstructed light; so that too much shade has the tendency to spindle out what previously existed. Use it, therefore, but do not abuse it.

Aspect.

A south window is the best position for plants during the winter and spring months. For the summer months, north or east is preferable.

Watering Plants.

There is no subject more perplexing to beginners than this. I know I can not advance one new idea, but will treat the matter simply, arranging my observations under three divisions—When to water, How to water, and What water to use.

When to Water Plants.

When to water plants is governed by the circumstances of the plant at the time, whether growing, at rest, or approaching a state of repose, and on its position as respects sunshine or shade, and a high or low temperature; so that judicious watering is not so much a matter of regular routine, as of thought, intelligence, and adaptation to circumstances. Watch the first signs of distress, and there and then apply the relief. Do not wait for the proofs of suffering, in the plants wilting and hanging their heads in festoons around the pots. As a general principle, the same rule holds good in respect to a cutting. Here is a cactus; water it regularly, and you will kill it with juices it cannot get rid of. There is a bulb which requires a season to ripen and another season to rest; continue to water it, and if you do not kill it, you will look in vain for flowers another year. Plants may wilt from weakness, or excess of sap in the

tissues, or from sunshine on their leaves and stems, especially after dull weather, and yet not need watering. The question is often asked: Which is the best time of day for watering? No doubt during the summer months the evening is the best time, as at night every part of the plant is filled up with moisture, and the morning finds it enlarged in stature, or in size, and much renewed in health and vigor.

Though many of the objections to watering in sunshine are largely theoretical, and appear only in the writings of those who have had but little actual experience. The real objection to watering in sunshine is, that the water is rapidly dissipated, and this prompt evaporation induces such an amount of cold, that retards rather than stimulates growth. Whether plants grow most by day or night, may still be a doubtful question, though cultivators believe they grow most at night; certainly night growth would be still more effective were plants watered near sundown, as evaporation is so much less rapid at night, and this loss of heat is avoided.

How to Water Plants.

When water is given to the soil, let it be in such quantity as to reach every root, and then wait until the soil becomes dry again. Mere surface watering leaves you in ignorance as to the state of the bulk of the soil. To a great extent the same rule applies out of doors, encouraging surface roots at one time to render them liable to be scorched at another, while the mass of roots below is rendered torpid and inactive.

What Water to use.

Rainwater is best, as nothing is more certain than that hard water will kill hard-wooded, fine-rooted plants. It should be used at a temperature somewhat near that of the room, and is improved by exposure to sun and air. When kept in tanks below ground, it is frequently rendered as hard as spring water from its absorbing magnesia or lime from the materials of which the walls of the cistern are composed. Stronger liquids, containing some manurial matter in solution, if given, should generally be done at the period of flowering. Such solution should be weak and clear. All over stimulation of the plant-system should be avoided, some plants bear it, but others, as in the carnation and the rose, a distortion of the flower may ensue. The stamen, may change into petals, petals into leaves, or the flower may become altogether double if the soil is too rich.

Table.

Plants in rooms are best grown in hollow tables lined with zinc, and deep enough so that the tops of the pots may be covered with moss. What we will now discuss has reference chiefly to those operations necessary to keeping plants from season to season, and to providing ourselves with young plants from seeds or cuttings, a matter of no small moment to window gardeners, as it is seldom desirable that our plants should assume large proportions.

Potting Plants.

Many of the plants we have tended with so much care are now demanding more pot room, or fresh earth, in similar or smaller sized pots, by getting rid of a part of the old soil. As a general rule, pots ranging from three to six inches in diameter are large enough for windows, increasing the size of the pot

from an inch to an inch and a half in diameter. No plant should be transferred to a larger pot while its ball of earth is dry, as no ordinary watering would ever afterwards moisten it, nor should it stand deeper in the new pot than it did in the old one. In every case it is well to wait until a plant has filled with with its roots every part of the pot it occupies before changing it into one of a larger size, and in all cases the compost must be pressed firm and to an equal degree of firmness all around the ball; for if less firm on one side than the other the water will drain away down that side, and the other side will be only portially moistened. When new pots are to be used, place them in a tub of water for several hours, allowing them to dry thoroughly before using. The reason for this is, that in proportion to the porosity of new pots would they extract moisture from the soil, forming a vacuum between the pot and the soil, which might deceive you very much in future waterings. Old pots are as good as new, only they should be clean inside as well as outside. Put a plant in a clean pot and in time it becomes well rooted. If you wish to repot it the ball of earth will come away from the pot as clean as possible, but if the pot had been dirty or wet when used the ball will be broken and the roots very much injured. For house culture in general I would prefer hard burned pots and of a light color, as the soil would then have a more even temperature and there would be less absorption and radiation of heat. Neat, strong pots might be made of zinc and the outside painted so as to look very ornamental.

Soil.

Loamy soils taken after removing the grass sod, with the addition of a little leaf mould, will grow almost any plant that would be a real ornament to a window. Leaf mould not only keeps other soils open, but from the vegetable matter it contains acts as the best assistant to plants. In practice it will be found that young plants of all kinds, and especially soft-wooded plants, thrive best in a light soil containing a large proportion of sand and leaf mould: whereas, plants that are advanced beyond the stage of infancy, and all plants of woody texture, require a firmer compost. The vigorous circulation induced by too rich soils should be avoided, as with abundant moisture they give us strong shoots and great luxuriance generally, but few flowers; to get these, less water is needed, and more of the solid matter it contains. We see this in the well-ripened wood of the peach or grapevine, so necessary to good bearing, and generally in the fact of plants flowering, not on sappy shoots, but on the matured wood of the present or previous season.

Drainage.

As a general rule, every plant in a pot over four inches in diameter should have one inch of drainage, over which place a layer of moss; it is valuable as a moisture, equalizer, and will prevent the drainage clogging up.

Having discussed the operations necessary for keeping plants robust and healthy, our remarks will now have reference to the propagation of plants from seeds and cuttings.

Raising Plants From Seed.

The essential conditions necessary for raising plants from seeds are warmth, moisture, comparative darkness, access to atmospheric air, and a light, sandy soil. Whatever be the temperature in which a plant rejoices, a little more heat may be given to promote the germination of its seeds. Even the seeds of the most hardy plants will bear a strong heat with impunity, if as soon as they are

up they are gradually hardened off. Some seeds are so hard that we may bury them for months before the shell shall be burst by the embryo, because moisture can not reach them: these may be soaked in water of a temperature of 130° for a couple of days. In sowing seeds, a good, general rule is, to cover only to the thickness of their own diameter, and small dust-like seeds should be sown on a damp surface, without any covering of soil whatever.

A box, a foot or so square and three or four inches deep, is better to sow seed in than a pot, as it retains moisture longer; and this is one of the secrets of raising plants from seed, as they are apt to perish if frequently watered before they have gained some strength. Fill the box to within one inch of the top with light porous soil and press smoothly with a piece of board, after which give a good watering with a fine sprinkler, then sow the seed and press gently into the soil. Cover the box with a piece of glass and on that place any opaque substance, such as a piece of paper or a little moss, and stand the box in a shady corner. The glass will check evaporation from the soil and yet allow of the admission of air, while the box will absorb quite as much moisture as it parts with, and thus the soil will hold just enough moisture to slowly expand the integuments of the seed. Failures in raising plants from seeds are chiefly due to getting the seeds too deep, or from filling the pot or box too full of soil and sowing too near the surface that the seeds are dried up or washed away in watering.

Propagation of Plants from Cuttings.

Success in rooting cuttings will, in general, be in proportion to our skill in preventing the cutting feeling its removal from the parent plant. Hence, other things being equal, well-ripened shoots of deciduous plants are more easily rooted than those in a less mature condition, though if proper conditions were at hand the latter would root the soonest. Suppose you have a nice growing plant in your window early in May, and it has many young shoots on it two or three inches long, slip them off close to the stem, cut off a few of the lower leaves and insert in a pot of sand, expose them to the sun and air in your window and most likely your labor will be in vain; but cover the pot with a a piece of glass, to keep the atmosphere about them moist, and shade from sunshine until they can bear it without wilting, and you will have rooted plants in as many days as you would have in weeks from deciduous cuttings. In general it is best to have a cutting cut off at a bud, as the vital forces are stronger there and there is less danger of their decaying from extra absorption of water. Sand as a medium in which to root cuttings is preferable to anything else; because it prevents too much water collecting about the base of the cutting, on the one hand, and on the other the entrance of too much air to dry it up. Other methods of propagation are chiefly the separating of tubrous and bulbous plants and the dividing of the roots of herbaceous plants.

Freezing of Plants.

Whenever plants get frozen they should be thawed out gradually, by putting them in a cool, dark place and sprinkling with cold water. When the frost has thawed out restore them to the light.

Worms in Pots.

Lime water will remove the ordinary worms from plant pots; the strength is of no particular consequence, so long as the water is perfectly clear; but to kill wireworms you must use salt, or some chemical stuff equally strong, which would

have a like effect on the plant. The most effective plan to get rid of worms is, to heat the soil before using. It involves some trouble but is very effective.

Plants to Bloom in Winter.

About the latter end of May plants intended to flower in winter may be placed in the ground up to the rim of the pot; they should be turned two or three times during the summer, to prevent rooting in the ground, and liberally watered; though if well rooted in their pots, most plants will do better turned out of their pots and planted in the ground. If treated in this manner, they should be potted early in September, and stood in a shady place until they become rooted in their new quarters. While in the ground during summer, they must not be allowed to flower, because the plant we wish to flower at an unnatural time of year must not have exhausted its flowering powers during summer. A plant well prepared for winter flowering should be well rooted in its pot, with plenty of flowering wood, ready, when properly supplied with the stimulus of heat and moisture, to burst into bloom; but plants taken from the ground after flowering all summer, potted, and placed in heat at once, meet every difficulty unprepared, and will generally fail, the steady high temperature allowing the formation of blossoms only to a limited extent, and by spring such plants are worthless. On the contrary, if the plants when brought indoors in the fall were placed in a cool, airy room, they would ripen their wood, become strong and vigorous, storing up strength against the demand that will be made upon them in the future, and when brought into the warmer air of another room and carefully treated, flower as liberally, and as beautifully as the average of green-house plants. A general idea prevails that all plants must have just so much heat. This is true during the period of growth; but they also need a period of rest, and this rest can only be obtained by reducing the temperature below that point at which growth is excited, and still not so low as to endanger life. In summer nearly all plants have a tendency to increased vigor, and when taken indoors in the fall, if this heat is maintained they continue to grow, but such growth is unhealthy. Some of the mistakes most commonly made by the inexperienced are, potting too loosely, filling the pots too full of soil, and making no provision for drainage. These matters seem small, but it is usually the attention to small matters that makes the difference between success and failure. It has often been truly remarked, that the gardening carried on under the greatest difficulties often yields the greatest enjoyment. Some of the most enthusiastic, determined gardening has been successfully accomplished in our large cities and towns. It should be thoroughly understood that no amount of instruction can compensate for any lack of personal attention, as the art of plant-growing can not be acquired from books; books are useful to give the impetus and to direct our energies aright; but proficiency is attained only by attention to causes and effects; if there is an interest in the work at its commencement, that interest will increase as skill and dexterity are acquired. The plants suitable for house culture are far more numerous than is generally supposed, we can therefore mention but a few, and those such as are more generally known; and first, there is no plant with which success is more certain than the Chinese primrose, as it readily accommodates itself to all conditions, and is in bloom from December to May. In the latter month place them out of doors, where they get but little sun, and during the summer pick off all flower buds as they appear. They should be repotted in spring. The Calla lily should be in every collection. It is not a lily, but pop-

ularly it is so. To have it flower in winter, it should be exposed to the full summer sun without water. Repot in August, shaking off the old soil, and place the pots in an exposed position until they are taken indoors at the approach of frost. The Calla likes an abundance of water and light. The Cyclamen thrives well in an atmosphere where other plants suffer, as it seems to be but little affected by the impure air of our rooms. Repot the bulbs in September or October, placing them in their pots so that the crown of the bulb will be just above the surface of the soil; stand in a sunny window and water while the plant is in bloom and the leaves green. After the flowers have faded, and the leaves show a yellowish tinge, gradually withhold water and place the pot in a shady position out of doors for the summer, but never allow the bulbs to shrivel.

The Pelargonium.

Under this head I include the whole group of geraniums in general cultivation, but can only particularly notice what is commonly known as the Lady Washington geranium. This plant after flowering should be placed out of doors for some weeks to ripen its wood, giving no more water than will keep its leaves from wilting; you must then prune back to two or three buds of the old wood, keep rather dry for a week or so, when they may be watered; re-pot into smaller sized pots; when the young shoots have grown one inch, trimming back any straggling roots, and in February transfer to a larger pot in which it will flower. All varieties of the pelargonium are readily grown from cuttings planted in July or August, or from seed sown in spring. The variegated, scented zonales and ivy-leaf geraniums are all desirable, especially the zonales, which are valuable for winter blooming. Fuchsias should be brought from the cellar in February or March, and pruned back closely; water sparingly until growth begins, then transfer into smaller pots—using larger ones until it is desired to have them flower; after flowering, withhold water and return them to the cellar during winter. The fuchsia likes partial shade, rich soil, and plenty of water. Carnations of the tree kind bloom freely in the window. Cuttings may be rooted at any time during winter; pinch out the center of the young plant, and plant in good soil out of doors in spring; pot in September, before severe frost. It is necessary to start with young plants every spring. Oleanders are readily grown from cuttings in a phial of water. We must prune and treat this plant as we wish some of the shoots to flower this year, and some the next; or all one year and none the next. Whether a plant blooms every year, or every second year, the flowers can only be produced this spring and summer at the ends of shoots grown and matured last season. Here in May is a plant with two shoots; one shows signs of flowering, the other not: I cut the flowerless shoot down to near its base; from thence I get two or three shoots for next year; when done flowering, I cut that shoot down also, so as to obtain a further succession of shoots; these are induced to grow as much as possible until September, after which keep in a low temperature, and give but little water until growth recommences in April.

The Rose.

The everblooming class are best for house culture. Roses for winter blooming are usually grown in pots all summer; but two or three year old plants may be grown and flowered in the ground all summer, and if potted early in September, and kept from wilting, they will fill their pots with healthy fibres

by October, and flower abundantly all winter. The case is different, however, with younger plants grown in the ground; these having few if any feeding roots, must be kept at a low temperature for some time until nature has restored the loss incurred in digging them up. These roses should be potted in October, and placed in a cool, light cellar until February, then placed in a sunny window where they will flower the remainder of the winter and spring months.

The Cactus.

All of the cactus tribe should be treated somewhat alike. Use sandy loam and lime rubbish, with a little leaf mould, for potting. They bloom chiefly during the summer months. Water liberally until the middle of September, from this time until March they would hardly need a drop, unless the stems get very brown and shriveled.

Hanging Baskets.

Plants with slender drooping foliage are most suitable for baskets, such as the smilax and maurandia. The former has a tuberous root, and should be dried up in summer. The nastertion, especially the dwarf, dark varieties, climbing and drooping, are very desirable. The German and English ivies are graceful and of very easy growth, as are also the well-named rat-tailed cactus and the so-called ice plants. All of these are good, and are but a few of the many available for this purpose.

Fern cases are a never failing source of pleasure when properly managed, the soil for which should be a sandy loam and leaf mould. Give water sparingly in winter and more abundantly in summer. Occasionally admit a little air, and when not too powerful expose the case to the influence of the sun. No doubt nine-tenths of the cases in use are supplied with an excess of moisture. Drainage and having double bottom attached to the case to catch the surplus water would remedy this. To plant a fern case it isn't absolutely necessary to purchase expensive plants, unless you prefer to do so, for if we go out into our woods and marshes we shall there find plants and flowers that are the admiration of thousands on another continent. Almost every house has a cellar, which, if dry and frost-proof and having good light from windows on the south, east, or west side, but no openings to the north, would be a suitable place to keep many plants in winter. Let it be remembered that the great essential to their preservation is dryness. A plant will exist during winter and at its period of rest, even if very dry, though the extreme of dryness sometimes causes decay. When obliged to water, let it be given in mild weather and just sufficient to maintain life. Geraniums, fuchias, the agapanthus, hydrangeas, and orange and lemon trees are a few of the many plants that may be kept in this way. The care they require is but trifling and is amply repaid by the increased vigor of such plants in summer.

Cut flowers are a fruitful source of malaria in rooms, not from the odor from the flowers but from stagnant water or decaying vegetable tissues in the vessels containing the flowers. Putting a little charcoal in the water will keep it sweet longer; but the only sure remedy against putridity is frequent changing of the water.

There are many plants that would be as effective for the house as those I have mentioned, but I hope I have said enough to show that the materials for beautifying the humblest home are neither scanty or costly, and the care neces-

sary to their successful culture opens up a new source of thought and supplies a pure source of enjoyment.

Mr. H. Collins, of White Pigeon, read the following essay on

FRUIT CULTURE ON THE FARM.

The growing of fruit on the farm for the use of the family is a matter of the highest importance and deserving of far more attention than it has yet received because, first, fruit is the highest development of vegetable life; second, it is the only product of the farm suitable for human food without previous culinary preparation; third, fresh, ripe fruit eaten at proper times and in suitable quantities, as part of the regular meal, is easy of digestion, nourishing, and healthful.

The fact has been demonstrated that it is possible to have fresh, ripe fruit the year round. This would be true even had we no other than the apple. By selecting varieties ripening in succession from the Early Harvest and Tetofsky, ripening in July and August, to the Golden and English Russet, which, under favorable circumstances, may be kept during most of the year, this result may be reached. But we are not confined to apples alone. First, we have the strawberry, with its fine and delicate aroma, ripening in June, and followed by raspberries, blackberries, currants, gooseberries, cherries, peaches, plums, grapes, and pears, filling up the whole summer and constituting a variety that ought to satisfy the most delicate palate. It is possible for farmers even, to have some of these on their tables at every meal; but eternal vigilance in waging a war of extermination against their insect enemies, would be necessary to the successful culture of some of them. It is not my purpose to treat of this branch of the subject in this paper—that will be done by others more competent. What I want to urge most strongly is the importance of having the family well supplied with good and choice fruit; that few comparatively are, is not to be wondered at when it is remembered that the taste of most *men* has been vitiated by long chewing of the filthy *weed*, which is more sought after than the best of fruit.

Profitableness of Fruit Culture.

In considering the profitableness of "fruit culture for the farm" in St. Joseph county, I shall confine my attention principally to the apple, as successfully raising the finer fruits so as to insure profit, requires greater care and attention than the ordinary farmer will devote to it.

I often hear the remark from farmers that the apple is not a profitable crop, —that in seasons when the crop is abundant the price is so low that they are scarcely worth marketing at all. True, the prices obtained by our farmers for the crop of 1878 have not filled their pockets with greenbacks, as in some former years, but good apples are now worth two dollars per barrel, and had our farmers been prepared to keep them through the winter, better prices might have been realized.

But I believe I can show that apples can be grown at a profit even at seventy-five cents per barrel, which was about the average price obtained last fall.

I will give one example in the township of White Pigeon:

An orchard of five acres, on a poor sandy knoll, with very little care in pruning, no culture at all and no manure (one half of which is common fruit, fit only for cider), produced the following in 1878:

100 barrels, sold at 75c		$75 00
10 " cider, sold at $3.20		32 00
30 " " " $2.00		60 00
Total		$167 00

To this should be added 10 barrels of apples put in the cellar for family use.

This same ground in wheat, one half of it would have given about ten bushels to the acre, and the other half, which has not been plowed for years, and grows nothing but weeds, would have done well at five bushels, making $37\frac{1}{2}$ bushels, at 90 cents, would equal $33.75. The cost of growing, harvesting and marketing the wheat crop would have equalled, at least, all the work done to the orchard and gathering and marketing the fruit. These figures show a balance of $133.25 in favor of the orchard.

I regret that I cannot give an example of an orchard in St. Joseph county showing the highest state of cultivation. Such there doubtless are, but they are not within the range of my acquaintance. S. B. Davis, near Mottville, whose orchard is just over the line in Cass county, offers the best example I have found in this part of the State. This orchard, of eighteen acres, the most of which was planted sixteen and seventeen years ago, has been kept well trimmed and manured. It was seeded to timothy three years ago, and has cut two tons of hay to the acre. In 1877 the sod was removed around the trees in the fall, a circle of six feet diameter, and manured with fine manure from the hogpen and barnyard, a two-horse load to three trees. The soil is a heavy black loam with clay sub-soil, and is capable of producing twenty bushels of wheat to the acre. In 1878 the crop of fruit was of superior quality and free from worms. The yield was 900 barrels of shipping apples and sold for one $1, exclusive of the barrel, equal to $50 per acre. In 1872 the yield was the same number of barrels, and the price obtained, $2, equal to $100 per acre. I cannot give the cost of the labor and manure applied to this orchard, but I think the 36 tons of good timothy hay taken from the land would balance the scales; and bearing in mind that this work and manure is not applied every year, but once in several years, and we must conclude that the orchard has yielded far more profit than any farm crop that could have been grown on the same ground. One other fact in regard to this orchard I think will be of general interest. A portion of it (about 8 acres) consisted of trees considerably older and grafted in the top. Among these is a Talman Sweet, the trunk of which is about two feet in diameter, the limbs extending a distance of 27 feet, the tree filling a space 54 feet in diameter. From this tree, in 1872, there were gathered seventeen barrels of shipping apples and three barrels of culls. At $2 per barrel, the price obtained that year, gives $34 as the product of this one tree for that year.

If fruit culture on the farm is not profitable, taken one year with another, it is more the fault of the farmer than the fruit. The orchard is left to take care of itself, no measures are taken to destroy the wormy fruit, the codling moth is propagated by the million, and poor, wormy fruit again is the inevitable result. To make fruit growing on the farm profitable we should at least give it as much care and attention as we do other crops. Fruit trees must be *fed*. We cannot expect to take a crop of grain or grass from an orchard, and at the same time get a good crop of apples, unless we manure heavily. Then again the orchard needs protection from the prevailing southwest winds which

sweep with such force across this part of Michigan that most of the apple trees stand leaning to the northeast at an angle of 45 degrees, more or less, and often the bark on the southwest side either dead or in an unhealthy condition. The value of a good wind-break is so well known and so clearly proven, that I need not take up time in discussing it.

Marketing.

To secure the best results from fruit growing on the farm it is essential that the best markets should be reached at the most favorable time. If every farm could have a fruit house, or if several in a neignborhood could coöperate in having one, in which a portion of the crop could be stored to await better prices, the question of profit would be less doubtful. The effect of rushing almost the entire crop of wheat to market last fall was to produce a perfect stagnation in the market, and consequent fall of prices. Could one-half the fruit crop of Michigan have been stored last fall, it is now apparent that the net results would have been much greater. Then again, if farmers would learn the lesson of doing their own business and dispensing with the services of a part of the middlemen, they might do better still.

Drying Fruit.

Every farmer's family should have a fruit-drier, by the aid of which much fruit that now goes to waste could be saved. Although apples dried as they ordinarily are in the sun bring but a very little, it has been demonstrated that good fruit, dried with fire heat by the modern processes, will bring remunerating prices, if put up in suitable packages and sent to the best markets.

Raising Fruit for Farm Stock.

I believe that apples may be profitably grown for feeding stock. For this purpose sweet apples are better than sour. An intelligent and successful farmer in Western New York over thirty years ago told me that he considered sweet apples excellent for young colts after taking them from the mares. I believe that hogs and sheep would do good service in the orchard in picking up the wormy fruit.

Varieties.

In selecting varieties for farm culture, I should be governed by the purposes for which the fruit is wanted. For market, I should plant Duchess of Oldenburg and Maiden's Blush for fall. For winter the Baldwin should predominate. But as this paper is already too long I will not pursue the subject further.

DISCUSSION.

Mr. Vandeventer said he had assisted in setting out an orchard forty-six years ago and it is now bearing well. Farmers usually do not give their orchards sufficient care. For a few years the complaint has been that apples do not pay. It is so with other things as well as apples. He spoke of the apple as the most hardy of all fruits, requiring the least care, and we could have it nearly every month in the year.

Mr. Dougharty said that fruit cost little as compared with grain, and it stood next to bread as a healthy food. He regarded a man as negligent in regard to duty who failed to furnish his family with an abundant supply of fruit.

Mr. Hull and Mr. Sharp also participated in the discussion, agreeing with

the essayist in regard to the importance of fruit for family use but expressing the opinion that otherwise apples were not a profitable crop.

Mr. Collins, in reply to a question by Prof. Cook in regard to cultivation and thinning, recommended thorough preparation of the soil before planting the trees—by draining and cultivation; would recommend low hoed crops while trees are young; manure heavily. Mr. Hull thought it not best to manure or plow too close to the tree.

Mr. Simpson of Nottawa read a short paper on "Hogs."

Of the different breeds of hogs he had tried, the Chester Whites and Poland Chinas, he preferred the latter. He said he had not been troubled to any extent with hog cholera.

Mr. Davis of Iowa, who was present, said he kept a large number of hogs. He placed tar about the runs and places where the swine would rub. His neighbors were now trying this and escaping the disease. He also advocated the parching or scorching of the corn fed to the hogs as being an excellent preventive of cholera.

Prof. A. J. Cook read the following essay on

CARE AND MANAGEMENT OF POULTRY.

I am quite sure, if we except the care and management of swine, there is no part of farm economy more sadly in need of reform than that which pertains to the poultry yard. Unsuitable arrangements and wanton neglect characterize the general farm management of the chickens. Poultry-keeping is no exception to the general principal in all business,—that neglect is very expensive. I speak with assurance on this subject, for as a boy on the old farm I saw the results of the faulty managemant. Later I have reaped the fruit of a better system. Nor was my father's management of the poorest. I doubt if there was a better in the vicinity. He gave the chickens a warm house, and always kept food before them. Faultless roost-poles were in position, and cosy nests were arranged to tempt to egg-laying; but for a good part of the year it was only this and nothing more. But cleaning from under the roosts, cleansing the house, giving warm drink in winter, or any drink at any season, feeding meat or vegetable food in winter, or making the house light with ample, sunny windows, all this was never thought of. We got abundant eggs in summer, when eggs were almost worthless except to aid in pastry and add a relish to the table, and had the chicken stew, the roast, or the famous chicken pie whenever desired, and all ignorant that more was possible, we learned therewith to be content.

I would not say, nay, I am of contrary opinion, that even with such care chickens are not a desirable addition to every farmer home; but I would say, and emphasize the truth, that there is a far better way. Under the old system, poultry on the farm is in some sense a convenience and a luxury. Under a better system the convenience is increased, the luxury augmented, and there is also a considerable profit.

Two years since, wishing to have chickens at hand to aid me in my scientific study and research, and wishing also, if happily I might be able, to add to our larder the luxury of ever-waiting fresh eggs and as constant subjects for tempting Thanksgiving or Christmas roasts, I set earnestly to work to learn how. I sent for sample copies of the several poultry journals published in our country, selected the one I thought the best and at once subscribed for it. I also secured what I learned was the most thorough book on the subject. This only cost

me $15. From close study of these I found that the following were among the requisites to successful poultry culture: A warm, roomy, well-ventilated house, with windows so arranged that ample light and sunshine should be as little a stranger as possible during all the long winter. The roosts, should be so arranged that the droppings could be easily removed, so that at least as often as once a week in summer and once in two or three weeks in winter these should be carried out. The above, together with frequent cleansings of the house by whitewashing, sprinkling with carbolic acid solution, sprinkling the nests with sulphur, and rubbing the roost-poles with kerosene, I found urged with emphasis by all chicken fanciers. The nests should be rather secluded, moveable, and numerous enough to prevent any quarreling. The feed-box and water-trough should be so constructed that neither the food or drink could be rendered filthy by the not over scrupulous fowls.

With the above principles in view I built a double-walled house, closely packing the eight inch space between the walls with straw. On the south side my house slants like a roof, and set in this inclined side are two large windows. There is also a glass window and door on the west, and a window on the east. My barn stands immediately west of the poultry house, so that the latter is not exposed to the severe winds of winter. The windows can all be opened in summer, so it is easy to secure ample ventilation. The roost-poles are above two inclined boards which direct the droppings into a light trough, which may be esily carried out and emptied. The water vessel and the box in which I feed cut vegetables, meat, and warm slops, are immediately behind a lath screen, made like a picket fence, and so made as to be easily set aside when I wish to add water or feed. My grain box stands on an inverted pan, which in turn rests on a post two and a half feet high. Thus it is mouse and rat proof. On one side the bottom of the box projects, so that it may support the fowl while eating. The wall of the box on this same side does not quite reach the bottom, so it allows the grain to pass out in small quantities as it is needed or used. A second shallow box receives this. Thus we see that the feed is always fresh and clean. The house is eight by sixteen feet, and large enough for 30 fowls. It can be thoroughly cleaned and whitewashed in three hours, at a cash outlay of five cents, which pays not only in securing healthy fowls, but also for very looks' sake. To a pail of whitewash I always add a large handful of salt.

What Breeds to Keep.

From all I could learn after a careful study of the subject, I decided that for both meat and eggs, no variety ranked higher than the light Brahma, while for eggs the brown Leghorns were perhaps first. For experimentation I wished varieties as diverse as possible, and secured them in the above breeds. The color and size of the eggs, and the appearance, habit, and temperament of the fowls are indeed very wide apart. With the light Brahmas we have not been disappointed. They have proved even better layers in winter than our brown Leghorns, their eggs are fine in quality, large, and of rich color. At the age of six months the cockerels weigh seven and eight pounds, and while they may not quite equal the Games, the Dorkings, or the Houdans for table use, I am sure no one will go away hungry or dissatisfied from a dinner graced by a light Brahma. From my own experience, as also from a thorough study of the opinions of others, I think there is no fowl that equals the light Brahma for the farmer. Possibly the Plymouth Rock may rank nearly as high. The

quiet temperament, too, is a recommendation of no mean rank in favor of these fowls. The chief objection, and the only one, so far as I know, unless we might desire a little more white meat, is the proclivity of this breed to sit. With suitable preparation to break this determination, it is no serious objection, especially if we kill all our hens the second winter, never keeping them till they are two years old. I have noticed that there is a great difference in individuals in this respect. So without doubt by careful selection in our breeding we could modify this trait to our satisfaction.

The brown Leghorns I have found to be perfect non-sitters. They are admirable layers, except in cold weather—perhaps my house is not warm enough for them—when I have found them much inferior to the light Brahmas. The eggs are white, large, and fine. The Leghorns mature quickly, when they weigh three or four pounds, and are, I think, almost useless for table use. They are wild and intractable. A fence five feet high is Brahma proof. As much cannot be said of one three times as high if the word Brahma be replaced by Leghorn. I cannot recommend the brown Leghorn, though I have a flock for sale. From my reading, and a slight experience, I think I might almost say as much of the Spanish, the Hamburgs, and the white Leghorns. Though I am satisfied with the light Brahmas I have a desire to test the Games, because of their incomparable excellence for table use, and the Plymouth Rocks, which are so highly recommended by those who have them. Yet I feel assured that this test, which I am to make in the coming years, will only serve to make me more a friend of the light Brahmas. The grace and symmetry of the mature light Brahma is fully comparable to that of our best bred Shorthorns, while their color forms a beautiful contrast to the green of the summer landscape.

Management of Fowls.

I wish now to name some of the more important points connected with the care of poultry,—points that can never be profitably disregarded, as attention to them will secure healthy birds, abundant eggs at all seasons, and best of all, greenbacks, if you are a greenbacker, and gold if you are a hard-money man.

Care in Winter.

At this season your flock will consist of hens and such cocks as you desire to breed from the next spring,—never more than one for every ten hens. Whenever the weather is cold, keep the chickens close in the house. To be sure they may be allowed to run out, as the cattle too often are, but never except at a great expense of eggs and flesh. Kept in a warm house, they will lay. Exposed to the severe cold, all the vital force goes to supply heat. They will eat much more and return much less. In the morning feed warm slops, made thick with the refuse from the table and meal, and liberally supplied once or twice a week with finely cut meat and vegetables, such as apples, potatoes, cabbage, and celery tops. This may well be as hot as will answer for feed. The writer of the Kerby Homestead papers, F. D. Curtis, remarked in a recent number of the Rural New Yorker: "I have a very eccentric neighbor. He feeds his hens in the morning, but he has eggs." Could he have said hot feed he might have added and to sell. Only feed what they eat clean. At noon give them warm drink and as much mixed grain as they will eat during the afternoon. At night carry in all the eggs. You need leave no nest eggs, for

with such care they will lay without coaxing. Once every two weeks clean out the droppings under the roost. Sprinkle the nests with sulphur, rub the roost-poles with kerosene oil, and if you have any indication of lice, put a little ointment made of sulphur and kerosene oil, equal parts of each, under the wings of the fowls, about the breast and legs, and on the head. In one end of the house keep a good sized box full of coal ashes, or in lieu of these finely pulverized earth gathered the previous summer from the roads. Such a dust box is used with evident show of satisfaction by the fowls and helps wonderfully to keep the birds in perfect health. Old plaster or ground oyster shells should also be given to the fowls.

Spring Management.

In March set your hens. This secures early chickens, which will make capital roasts for Thanksgiving and plenteous eggs for the following winter. The larger Asiatic breeds will cover 15 eggs to the hen; the smaller European breeds not more than 13. Cover the sitting hens with a wire or picket screen, so that no other hens shall trouble them, and keep them well supplied with food and drink. Keep the nests well sprinkled with sulphur; but do not anoint sitting hens, as eggs touched with kerosene are rendered worthless. On the 19th or 20th day it will be well to immerse the eggs, especially with the Asiatic breeds, for one-half hour in warm water, else the chickens may not be able to liberate themselves from the tough shells. If the nest is made on a thick sod, this will supply moisture, and the immersion will not be necessary. If the hen leaves the nest, even till the eggs get thoroughly cold, do not get nervous. Doubtless her ladyship knows her business. I have known eggs to be cold for hours, and yet receive no harm. I have reason to think that the heart of the embryo chicken may commence beating again with returning warmth, even though it had stopped for a brief time because of a long chill. It is well to assure ourselves that the inclination to sit is strong before we supply the eggs, though with Brahmas this is not very essential.

The young chicken should be kept in dry, warm, clean coops, and must be constantly supplied with clean water and nourishing food. Scalded mush, hard-boiled eggs, and crumbs of bread and boiled potatoes are all excellent food for young chickens. A single hen will safely brood 20 or 30 chickens, and two broods, if hatched about the same time will be kindly received by either mother, and at quite a gain in prospective eggs.

After setting all the hens desired I should advise killing or selling all the cocks, as they should not be allowed to run with the hens in late spring and summer.

Summer Care of Poultry.

At this season the meat and vegetable part of the food may be omitted if the hens can have free run, otherwise, the diet of winter should be continued. In this last case, the dust box and ground oyster shells, or pieces of plaster, should never be neglected. Now the cleansing of the house should be frequent and thorough. Keep the lime for whitewash, the kerosene bottle, the carbolic acid solution, and the sulphur box in easy reach, so that there will be no excuse for neglect. Remove the droppings once a week. A comprehensive rule under this head is: never allow the poultry house to smell bad, which condition will only follow upon thorough cleanliness and ventilation.

At this season, if other breeds than the Leghorns, Spanish, and Hamburgs

are kept, the breaking up of sitting hens will be frequently necessary. This is best done by shutting the hen away from the nest, in sight of the other hens. A little pen made of pickets or lath, with shelter from storms, will answer the purpose admirably. Pins driven into the ground about four inches apart will prevent the sitting attitude and more quickly banish the sitting fever.

Autumn Duties.

These are pleasant, for now the March chickens are tender and luscious, and the injunction "kill and eat" will not be hard to follow. By New Year's I would have killed all the cockerels, except one or two of the finest, to be used for breeding the next season. Our cockerels hatched last March weighed 8 pounds in October. At 18 months they would have weighed 11 pounds. Hence, to keep them beyond 10 months is not the part of wisdom. After January 1, kill for the table such of the old hens and pullets as are not up to the standard. In no case is it best to keep a fowl beyond two years.

In summer and autumn eggs are often very plenty and yet hardly worth marketing. Such may be kept by burying in salt, or by coating with olive oil in which a little beeswax or paraffine had been melted. A better method, and one that will keep eggs so that even a Frenchman will find it hard to tell them from fresh eggs, is to place them in a fluid prepared as follows: To a gallon of boiling water add a quart of fresh lime. Stir for some time, and when cold strain it and add one-fourth pound salt and one ounce of cream of tartar. Fresh eggs, put at once—the day when laid—into this liquid and kept submerged till winter, will readily pass as fresh eggs. The pains taken keeps them fresh.

Care in Breeding.

In breeding poultry, as in breeding cattle, sheep, pigs or bees, we should have in our mind an ideal animal, and only breed from such of our stock as approach the most nearly to our ideal. In this way we not only improve our stock, but our business becomes a fine art. We are thus led to observe closely, to think as we work, and we find a rich pleasure in our business.

It is the opinion of some of our best breeders that the impure mating of a hen, if but for once, renders her forever afterward a cross. This view is urged by Wright, our greatest authority on poultry culture, by Burnham, one of the first of our American writers and breeders, and receives assent from Dr. Miles in his valuable work on "Stock Breeding." Felch, on the contrary, whose strain of light Brahmas is unsurpassed, contends, after years of experience, that there is no ground for the opinion. Being somewhat incredulous, I instituted the past spring the following experiment: My pure light Brahmas and brown Leghorns had run together all winter. The first of February I removed my light Brahma cocks, and in three weeks put 15 brown Leghorn eggs under a sitting hen. I repeated this at intervals of seven days for four weeks, when I removed my Leghorn cocks and returned the Brahmas. Three weeks after this I set 15 Brahma eggs, a week later 15 more, and so on till as before I had four hens engaged in the work of incubation. The first brood in each case furnished two or three chickens whose purity there was some slight reason to doubt. The others, and there were over 50 of the light Brahmas, show not the least mark of impurity. But, says one, it will creep out; just give it time. Most certainly I shall do so. I shall keep the Brahmas and breed from them, and if it does crop out I shall see it, and will as certainly report.

I presume some readers will shrug their tired shoulders at what I have presented, and with thoughts of an already irksome life, will mutter, too much work. But it pays. Besides, how easy to take the boys and girls into partnership—such regular duties will be valuable to them—and stipulate to give them half the extra profits to spend for good books and papers. In this way you will not only thicken your pocketbooks, but will put the dear children in the way of greater improvement and usefulness.

Mr. A. Sharp of Nottawa read an essay in which he argued that the raising of stock was not profitable in St. Joseph county, as the land was not adapted to grazing, and argued in favor of raising grain and vegetables to the exclusion of stock.

FRIDAY MORNING SESSION.

Prof. C. L. Ingersoll gave his lecture on Beef and Beef Breeds. (See Lectures given at more than one Institute.)

Mr. Dougharty of Park read an essay on

FARM STOCK.

We have not the manuscript of Mr. Dougharty's essay and did not hear it read.

The reporter for the Detroit Post and Tribune says Mr. Dougharty, in speaking of farm stock, said he was surprised that any one should vote to keep no stock. He was sorry Laban could not have heard Mr. Sharp's paper; it might have saved the pariarch the great deception. Showed that judgement was not exercised in breeding, especially in choosing sires. We must also look to our dams. Sires should not be grades or crosses, but all well bred. Care, too, is most important. The care expended will meet ample returns.

The speaker then showed by carefully prepared statistics that if we would select the best animals and care properly for them we could make, in excess of our present profits, enough to pay all our taxes. By keeping better sheep and cattle we might secure double what we now get for our surplus.

One of the greatest mistakes our farmers are making is in not keeping more stock, keeping better stock and keeping it better. Over half our profits ought to come from our stock.

Mr. Dougharty, in answer to inquiry, said he preferred fine wool breeds of sheep.

Mr. B. Hicks of Three Rivers read the following essay on

BUTTER MAKING.

I considered that one of the first requisites after obtaining the desired number of cows, was a milk house with flowing water, so I had a drive well put down close by the river, as that is the only place where a head can be obtained that will maintain a steady flow, and built a small house, 10x12, over it, of which I was the designer, architect, contractor, and builder. I built a trough along one side of the milk house about 16 inches deep and 20 inches wide. I then divided it into six square water-tight compartments about 20 inches square. The first partition was raised about one-half inch from the bottom, so

that the water coming from the flowing well would flow out under this partition; the next partition was made tight at the bottom, but was cut away at the top of the trough, so that the water would have to flow over the top of this partition; the next at bottom, and the next at top, and so on, thereby giving a perfect circulation of water, leaving no dead water, and maintaining it all at the same temperature. My milk pans are a large tin pan 15 inches deep and 19 inches in diameter. Why I use this particular size of pans is simply this: when I commenced the business I found that I had these pans on hand,—they were made for the purpose of setting large glass bottles into for safety,—and I made up my mind that they would be better than the dairy pails, besides saving the expense of buying. I have since tried the pails, and I like the pans much better, because they are much more convenient for skimming, hold as much as five dairy pails. The object of using these large pans is to save work, as with me it only makes one pan a day to skim, wash and care for.

I strain the milk, as I am doing this winter the night's and morning's, into the same pan, so that I am only using three pans in my dairy of eight cows. I see the ladies all shake their heads and say that will never do. What, strain two milkings into the same pan! and have the milk fourteen inches deep? Why the cream will never rise. But then I see that you are charitable and say, "just like a man." But I assure you, ladies, that the cream will rise, that the depth of milk or the amount of surface exposed has nothing to do with its creaming. My experience, along with some scientific experiments that have been made by eminent professors, has proved conclusively that the cream will rise just as well under those circumstances as it will when you spread it out all over the house in small milk pans or stone jars. I can cite a better proof than that. Several elderly ladies who visit our family, who know more about butter making than I ever expect to know, who, when told how I manage, shake their heads, know better, know that it will never cream that way. In order to convince them we give them skim-milk, "for it is always sweet," to drink and put in their coffee. I notice that when they come the second time they always take their coffee clear, and as to drinking milk, why they prefer water.

I let the milk set twenty-four hours after the last milking is strained into the pan. Of course you understand that these pans are placed in three divisions of the milk trough. When I skim it, using a pint cup such as the milk-men used to use when they dipped their milk from the top of a large can, the cream is a little over two inches thick. I then let it stand another twenty-four hours, when I again skim it, getting a little creamy skum. The milk is now as blue as a "whet stone." The only object in skimming the second time is this: In the first skimming a little of the cream is mixed back with the milk by the dipping of the cup. The milk is kept in this house the year round, winter as well as summer, for I believe that the colder you can keep milk, and not have it freeze, the quicker and better it will cream. In fact, I believe that if it is a good and necessary thing to keep milk cool in the summer, in order to have it cream, that it is equally as good for it in the winter time; but I find that the most of our butter makers provide themselves with an icehouse to keep their milk as cool as ice will do it in the summer time, in order that it may cream out, "you know." And in the winter they will put it on the stove and scald it, in order that it may cream, or in other words, they use just exactly the opposite means in winter, to obtain the same results, as they use in the summer. "Oh, consistency, thou art a jewel!" or if I might render the quotation in words suitable to the profession, I would say: Oh, consistency, thou art a cream of a jewel!

I put the cream into a tin pail twenty inches deep and eight inches in diameter, the same that is used in N. Y. State dairies to set milk in. When the first pail is full it is thoroughly stirred up and one-half poured into a second pail. The skimming is then into the two alike, and so on till I obtain a churning, thus skimming into all pails alike, and making the cream alike. By this course I have kept cream seven days in the summer without its getting bitter. These pails, of course, are kept in the water all the time. When a sufficient quantity of cream is obtained for a churning, it is taken to the house and set behind the stove to let it sour, which it will do over night. Then each pail is set into a kettle of water and brought to a temperature of from 62 to 68 degrees, according to the temperature outside, as the churn is in a shed. In warming the cream it should be thoroughly stirred all the time, so that it may all be alike. The churn is a barrel with four staves fastened edgewise on the inside. The churn is revolved, and these staves carry the cream up till it falls over, thus agitating it.

A small amount of June butter coloring is put into the churn with the cream through the winter months. The belt is then attached and I get my Jersey bull (for you are all aware that it takes the Jersey cattle to make gilt edge butter), lead him into the tread-power, raise the brake, and the churning goes on without any further attention from me. At the end of one-half to three-fourths of an hour I put in an appearance and generally find butter. The buttermilk is then drawn off and a couple of pails of cold well water put in; the churn is given a few more turns and the butter is ready to come out and salted, using one ounce of Ashton's dairy salt to the pound of butter, it is then set away for 24 hours, when it is worked. I use a large board two feet square to work the butter on. I take it out of the bowl in quarter sections and work it on this board, using a linen cloth to cover my hod with which the butter is worked (something as you women knead bread), the cloth taking up all buttermilk and water that is in the butter. It is packed into a wooden pail as worked, the top of the butter covered with a piece of dairy cloth, a handful or two of salt spread over this, the cover nailed on and marked with the name of the brand, it is then taken to the express office and I am through with it, all but spending the money when it comes, which I assure you is a very small part of butter-making.

One of the most important questions to be asked and answered in connection with this subject is the time of year to have our cows fresh that we may make the most money out of butter. My cows come fresh the last of September and first of October, by which means they are in full flow all winter, and when grass comes in spring they are as good almost as new milch cows. Then I dry them off the first of July, thus getting them out of the way through the hurry of harvest and the time of preparation for wheat seeding. By this course the cows are dry through the hot and dry months of July and August, and have nothing else to do through August and September but fight flies, which I take it is about all they ought to do. One of the most effective arguments in favor of this course is the price of butter, which we all know is fearfully low in the summer, but generally bears a good price in the winter. My butter has sold for 18 to 22 cents all winter. Another reason is the ease with which butter can be made in the winter as compared to the summer: and another reason is the more perfect creaming of the milk in cold weather, as I heretofore tried to demonstrate to you; yet another reason is the time that we have, "I mean men folks," in the winter to attend to the necessary work; and last, but not least, is the raising of calves. You can have sweet skim-milk for them, and

I want nothing better, if they only have all they can drink. I feed mine on milk till grass comes, when they are ready to take care of themselves, and grow and thrive, instead of going from milk into winter quarters and dry feed, as the other course necessitates.

Mr. W. B. Langley of Nottawa read the following essay on

CORN CULTURE.

Corn is a crop that takes less seed per acre than any other which we raise. There is no crop on which so much depends on the selection and proper care of the seed. We should endeavor to procure a corn that will produce the largest and most uniform sized ears with the least stalk. You will often see the largest stalk producing a very small ear. Greater ease and facility of husking can be obtained by selecting ears for seed that are small where they are attached to the stalk, this is also a mark of a good quality of corn. If a person in selecting seed corn will decide on what qualities they wish their corn to possess and will continue from year to year to select their seed with reference to those qualities, viz.: time of maturing, size of stalk, height of ear from the ground, color of corn, depth of kernel, size of cob, and if they find a quality possessed by other corn which they wish to add it can be done by getting the corn possessing it, mixing and planting it with their seed then continuing the selection. Some farmers never lose a crop of corn on account of poor seed, while others, after selecting, for want of care, have had to replant or lose their crop.

There is no crop to which so much injury is done by planting too close and putting in too much seed as corn. I am ofttimes reminded of an incident that happened over forty-five years ago, not far from the center of our county. There was a new settler just preparing for planting his first crop of corn in this country when older settler stopped, as he was passing along, to see what he was about, said to him, "We have got a good country here, Mister, but you cannot cheat Providence; he will not be cheated. If you will plant your corn four and one-half or five feet apart and not put in more than four kernels in a hill you will get a good crop of corn, but Providence will not be cheated."

Another settler who came about the same time from Pennsylvania, where they raised a small kind of corn and planted it close, in relating his experience, said the first year he planted his corn three feet apart each way, and, thinking the ground was new and strong and would bear it, put in from five to seven kernels in a hill, and he got a great deal of fodder and not much corn. The next he planted four feet apart each way and got a better crop of corn and not so much fodder. Well, that was what he wanted. The next year he planted four and a-half feet one way by five feet the other, and not more than four kernels in a hill, and he got a still better crop of good corn. There is a great deal of time saved in husking good, fair ears instead of nubbins. Who has not seen a hill of corn with a single stalk that would produce more corn than one with from seven to nine stalks with each a small nubbin that took longer to husk than a large ear? I know good farmers that have good ground, tend their corn well, and beat themselves by having too many stalks in a hill. I know a farmer that will not have more than three kernels planted in a hill that I never have known to fail to have a good fair crop of corn, and in good seasons large ones. Some, to insure a good stand of corn, will plant more than they wish to let stand in a hill, intending to thin it out at some time, which they never do, and so spoil their crop.

Next comes the ground and the preparation of it. I prefer a sod, clover if possible, with all the manure and fertilizers you can apply. I do not think you can get the ground too rich for corn, and I have seen great benefit from the sowing of from 80 to 100 pounds of plaster to the acre before plowing.

The plowing should be from six and a-half to seven inches deep (it is not best to get the fertilizers too deep) with a jointer, as it helps to make the ground mellow, and puts all the manure, grass and foul seeds in the bottom of the furrow, thus giving the corn a chance to get the start of all else. It is well to have the ground made fine and smooth before planting, when there is nothing in the way. Let the plowing be done as early as possible, some say in the fall, but there has been so little of that done, I have been unable to judge of it. I have seen a difference in favor of the earliest plowing where forty acres were plowed with one team. You could distinctly see each week's plowing, the earliest being the best. I have seen great benefit in having the manure spread on the ground in the fall, even where it was not near so good a quality as that put on in the spring, making a difference of from one-quarter to one-third in the yield of the crop.

At times we have been troubled with the cut-worm, and pieces of corn have been destroyed by them. The best remedy I have seen for them is to dissolve about three-quarters of a pound of copperas in water sufficient to cover one bushel of corn; soak it for twelve hours; then dry it, if you wish, before planting (it will help the dropping). I once saw a twenty-acre field, all but twenty rows planted one season, when the cutworms were very bad, with seed prepared in this way, in which you could not find a missing hill. The twenty rows were planted the same day by the same hands and with the same seed-corn, with the exception that it was not soaked in the copperas water, and I could not find more than one perfect hill in ten, and many were missing altogether. That which was soaked in the copperas water, when it came up was of a darker green, grew faster, and produced the best corn, attracting the attention of persons as they passed along the road. Some persons after soaking their corn roll it in plaster; that interferes with the dropping, and if you should have a cold, wet time after planting it, sometimes causes it to rot. I prefer to put the plaster in the hill dry.

In marking out the ground I prefer a marker worked by two horses, made with runners three feet long, with a piece running out behind with a leg attached, on which is a cultivator shovel running in the track of the runner, as it will make the mark deeper and leave the ground loose and mellow.

Instead of stakes in marking out the ground I prefer a guide that makes a mark which is followed by the middle runner, as I think it better, and I can get along faster.

In regard to the culture or tending of the corn, a great deal depends on circumstances. If you should have a hard rain soon after planting it might be well to drag the ground about the time or before it comes up, the ground should be kept loose and clean, gradually deepening the culture until the corn roots occupy the ground, then lessening the depth until it is finished, which should be so long that no weeds or grass should have time from the time you quit working it until the frost comes, to mature their seeds, thus cleaning your ground and insuring you a good crop of corn.

The crop can also be increased and the maturing hastened by the application of ashes, plaster, or salt. I know a person who last year left a part of his field without and tried the above mentioned fertilizer to the other parts of the field,

and by measure found that the salt added fourteen bushels to the acre to the crop it were applied when the corn was about six inches high. An old and one of the best and largest corn raisers in our county told me that he invariably applied ashes to his corn, and when he did not have them sent his teams around the country and gathered them up, paying in some instances as high as 12 cents per bushel, and thought it one of the best paying investments he could make on his farm.

In harvesting the crop some prefer to cut it up at the roots, thereby securing a large amount of fodder, and adding very materially to the manure of the farm. Others top their corn or cut the stalks above the ears, securing a large amount of good feed, saving the handling of the butts of the stalks, and add much to the facility of the husking. In husking from the hill it is generally practiced to throw the corn directly into the wagon, thus saving handling.

The cost of raising an acre of corn is about $10, and if the product is 40 bushels the cost of a bushel is 25 cents. The 40 bushels at the present market price (30 cents) would amount to $12 per acre and leave a profit of $2 per acre. The cost of raising 60 or 90 bushels is but a trifle more than 40 or less. If we raise but 25 or 30 bushels it costs more than we can sell it for; but if 66 bushels, equal 100 bushels of ears, the profit $10 per acre and the cost about 17 cents per bushel.

In regard to the amount of nutriment contained in the different kinds of corn, I found, by experience which I had in distilling, that we could not only get more spirits but also from one to one and one-half gallons of oil more from 25 bushels of Yellow Dent than we could get from the eight-rowed yellow or flint or white dent corn.

According to the report of the Department of Agriculture for 1877, I see that the exportation of corn and cornmeal is very much on the increase. In 1876 we exported 40,493,752 bushels of corn and 354,240 barrels of meal, value $34,510,307; in 1877, 70,800,983 bushels, 447,907 barrels of meal, valued at $43,132,397. This same report shows that there were but few States whose average yield per acre is greater than ours. I also find by the second annual report of the cereal products of Michigan that our county raised, in 1877, 910,680 bushels of corn at 30 bushels per acre.

Now, if by care in the selection of seed and better culture we can increase the yield 5 bushels per acre at the low price of twenty-five cents per bushel, we will add to the value of our corn crop $38,195.

Wm. Hull, of Lockport, read the following essay on

ESSENTIAL OIL PLANTS.

We live in a land of boundless resources. With a short notice and a suitable stimulus in the way of prices, we could supply the world with bread and meat; and the question to-day is, not so much how we shall increase our products as how we shall market those we have at remunerative prices or even at cost of production. It is as much the duty of the farmer to study the causes that affect the prices of his products, be it legislative or otherwise, as it is to study the soil or time of seeding. In 1871, when congress reduced the tariff on foreign wool, flooded the country with the foreign product and sent our own down to twenty cents a pound, which checked that industry and increased other products which were already too large to obtain remunerative prices, I do not think they meant to do us any harm, but they did not know any better, composed as they were, of lawyers and bankers; they did not know that wool was a product

of the farm, or had any other use except to pull over the farmers' eyes. Had there been one or two farmers there, they might have told them, and saved millions of dollars to the farmers of the country. There are other instances where legislation has discriminated against the farmers and the laboring class that I might mention, but suffice it to say that a true policy is one which will foster and protect every industry until every man, woman and child, willing to work, will be able to obtain every necessary of life, of which we have such an abundance, and then we would not hear so much about overproduction.

Again, it is our duty to diversify our crops, raising both the necessaries and luxuries, as much as possible, and sell them at paying prices. Essential oils, of which I shall treat at this time, belong to the latter class. In this county we have raised of these oils from fifteen to fifty thousand pounds, at an average price for peppermint, for the last fifteen years, of $3.00 per pound. But at the present time it is only $1.25, much below the cost of production, and tansy, wormwood and pennyroyal are equally low. The first requisite for successfully raising it is a rich soil and free from weeds. Some prefer turning under sod for corn, and following it with mint, but I have the best success, in fall plowing a clover sod, then cultivating as early in the spring as the ground will do to work, to be followed with the harrow, which puts it in condition for marking, which I do by removing all but two legs from a wheeled cultivator and attaching two large sized two-legged cultivator teeth, putting them two feet six inches apart, and running them deep enough so that when the roots are planted the row will be somewhat lower than it is between, all of which can be done very early in the season, whereas if we plant after corn we have to remove the stalks before plowing, which, if the weather is unfavorable, retards the work very materially, which may jeopardize the success of the whole crop, for as soon as the fibrous roots begin to grow the main root loses its vitality, and will send forth few and sickly plants, which will never make a full crop. The first requisite in planting is to secure good roots, and there has been many plans resorted to to keep the roots from winter killing, but with only partial success, the best of which is to plant what you want for roots the coming year where it will be sheltered by woods on the south and west.

The digging of the roots is usually done by plowing the rows, then shaking the dirt from the roots with a fork and putting them in heaps and immediately covering them with dirt to keep them fresh, as a very little drying will spoil them. The planting is done by arranging a sack so as to swing it upon the shoulders when filled with roots, thus placing one foot on either side of the furrow, then pulling the roots apart with the hands and putting them in in a continuous line and covering them with the feet. A good hand will plant an acre a day. If all the foregoing conditions have been complied with, we have only to give clean culture to ensure a fair crop, and in doing this we find we are aided materially by using a light harrow just before it comes up and at intervals, until it is large enough to start a cultivator and hoe. We have many styles of cultivators for this purpose, but all aim to have a tooth that will run very flat, so as to cut all grass and weeds without throwing dirt on to the young plants or ridging it up to prevent cutting it with a machine. The cultivation continues from the time the first weed starts until the first of July, when it is usually large enough to shade the ground, when it can be left until it is in blossom, when we commence cutting, and when partly dry, haul to the still, where it is immediately distilled, and the oil put in cans ready for market. The yield per acre is from ten to twenty-five pounds the first year, and from

five to ten the second, when it is plowed up and put in to other crops, to again be seeded. The cost per acre is from $12 to $14, and 25 cents per pound for distilling.

The cultivation of spearmint is the same as peppermint, and pennyroyal and tansy are similar, except it is planted in hills six inches apart in the row. Wormwood is raised from the seed and transplanted in rows, six inches apart in the row, when its after-culture is nearly the same as the foregoing, except it will bring several crops to one planting. The demand for the last four named oils is very limited. Wormwood a few years ago brought ten dollars a pound, when three or four farmers went to raising it and brought it down to one dollar.

I have been thus particular in describing the raising of essential oils because its production merits it, for we see by the report of the statistician of the Department of Agriculture for 1876 that the exports of hogs and their products have trebled from 1870 to 1875 and the exports of wheat have doubled in the same time and has quadrupled since 1850, and the export of corn has doubled from 1870 to 1875, and yet we have a surplus on hand of all these products, and if we increase their production for the next twenty years as much as we have for the last twenty it needs no prophetic vision to see that we shall not be able to find a market for them. With these facts in view it becomes our duty to encourage every industry that will diminish their volume, at least until they bring a price that will pay a fair profit for their production.

And for the introduction of new industries, the department of agriculture is of vast importance to us, yet our friends in congress give them a very meagre support. The provision for statistical investigation in 1876 was only ten thousand dollars, a sum not sufficient for the salaries of a meagre clerical force for compilation in the office, when $50,000 was necessary properly to supplement and complete the gratuitous work of the statistical corps, worth three times that amount. But "there is no lack of provision for investigation in aid of other industries. For the same year there was $140,000 appropriated for a geological exploration of the Rocky Mountains. In the same year the appropriation for the observation and report of storms was $470,000, for the benefit of commerce." Yet notwithstanding the meagre support congress gives, with the gratuitous work the people have given it, they have been able to do a great deal of good in the way of disseminating seeds and introducing new industries, the most important of which is jute culture, the possibilities of which are immense. Single or mixed it enters into a thousand articles of commerce. Professor Watterhouse, in speaking of its culture and manufacture, says: "Millions of dollars are now annually paid to foreigners for labor that ought to be performed by Americans. We are heedless of the lessons of public economy. A diversity of employment and an industrial independence of other countries will most efficiently promote the welfare of our own people. It is the true policy of the United States to introduce and naturalize the industries of the old world and to foster the common wealth of the nation by paying to American handicraft the millions which are now the rich reward of European skill, then the new enterprises giving employment to home labor and activity to domestic capital will quicken the revival of our languishing industries and aid in regaining our material prosperity and enrich the nation by the economy of millions which have heretofore been paid to foreign lands."

Mr. E. R. Willard, of White Pigeon, read the following essay on

PRACTICAL EDUCATION.

There is perhaps no nation on the face of the earth that is so intensely practical as the American nation. We are practical in our thinking, in our working, in our living, and I suppose I may safely say that we are practical in our *educating*. "How much is anything practically worth?" "how much does it cost?" "how will it pay?" and a thousand other similar queries are thoroughly American in their character and tendency.

Many of us have undoubtedly heard the pleasing anecdote that is told by a distingushed professor in one of our theological seminaries. He relates that while traveling in Germany, he one day met a German, who at once noticed a red-covered book in the hand of the stranger, which the German supposed to be "Murray," and accordingly asked the stranger if he was an Englishman. The professor replied, in German, that he was not. The conversation presently turned upon a work of architecture near at hand, and in the course of their talk the professor raised the question of its cost. "Oh," exclaimed the German instantly, "you are an American!" "How do you know that?" asked the professor. "Sir," continued the German, striking a peculiar attitude, and assuming a tone of great solemnity, "upon the resurrection morn, when we stand before the great white throne, the first question of every American in the whole assembly will be, "How much did that throne cost?"

If this is one of the peculiar and unmistakable characteristics of the American people, it certainly is in place at a Farmers' Institute in one of the most lovely counties in all America that the subject of practical education should claim a share of our attention.

What are we to understand, first of all, by education itself, and what do we mean when we speak of practical education?

The true idea of education is to be found in the derivation and meaning of the word itself, which is to draw out, or to educe. It is not cramming facts into the young mind; it is not learning dates of history and facts of science so as to be able to repeat them at the crook of the parent's or teacher's finger; it is not storing the mind with the principles of science or philosophy, as we now store our ice-houses with immense blocks of ice; but education is the drawing out of the intellect, the developing of the mental powers, and it consists in the discipline of the intellect, the culture of the heart, and the development of the reasoning faculties.

By practical education we mean that development of our educable powers or faculties which will fit men the better for the practical every-day work of life. Such an education will "teach us rather how to think than what to think,—rather to improve our minds so as to enable us to think for ourselves than to load the memory with the thoughts of other men."

Anything of a public character, affecting public interests, and that should reach the different classes of society must be brought down to the practical in idea and character,—must be practical in its objects, in its tendencies, and in its legitimate results if it is to be a permanent good to men. A religion that is merely theoretical and not practical in its character would really be more of a curse than a blessing, because its sure result will be to turn the lower classes against religion itself and lead them to be irreligious. A form or system of government that is merely an ingeniously constructed governmental theory will surely prove a veritable hot-bed of corruption and fraud. Likewise, if education will be a public national blessing it must be practical in its aim, in its

legitimate tendencies, and in its results, fitting men for more useful lives wherever they may go and making them better men.

All true educational work must be practical in its character, for the more and the better a man is taught to reason and think the more and the better mental discipline he attains; the more and the better a man is really educated the more and the better is he prepared and qualified for successful practical work in life. And yet is it not a fact that many of our learned men, who are regarded as well educated men, are sadly deficient in practical knowledge?

As a rather homely but apt illustration of this, I remember one of the most learned and scholarly men ever connected with the educational institutions of the Reform Church, a man who could read Latin and Greek with remarkable ease, who had delved in the very depths of the most profound philosophies, and who to-day is regarded as one of the most eminent scholars in our land; this man, of such varied learning, was so so woefully deficient in practical knowledge that he traded a pig, which he had fed with the greatest of care for more than a year, and which weighed, probably, 300 pounds,—he traded his nice large pig for a smaller one, weighing 50 pounds, because his own pig was too large for his pen and he did not know what to do about it, and he made an even exchange so as to have a smaller pig that could move about freely in his little pen. That man ought to have studied mental arithmetic and the science of common sense, for, though he was learned in the higher branches of science, he was sadly deficient in practical education, as these farmer friends will attest.

There is one opinion of the masses on this subject which we would controvert to-day, and we believe that we will be heartily supported in the effort by these distinguished professors with whose presence your institute is favored. A large proportion of the people have the idea that a practical education embraces only such studies as reading, spelling, geography, grammar, arithmetic, and writing, and that when we go beyond these studies we pass the bounds of a practical education. This is most assuredly a grievous error of the public mind. Geology, chemistry, physics, and kindred sciences are as appropriate branches of a practical education as the first mentioned studies, and if only they are taught in such a manner that their truths, principles, and facts will be applicable to every-day life, as they should be, they will constitute the most useful and permanently beneficial part of a practical education. There is far more real educational worth in the science of chemistry than in reading, spelling, and writing combined. This is undoubtedly one of the most useful and one of the principal features in the work of the agricultural colleges of the land, that they apply the higher sciences to the practical life and work of the farmer.

An institute, such as this, is certainly one of the most efficient agencies in furthering the cause of practical education among the farming people of our land. It stimulates thought, encourages investigation, calls forth freedom of discussion, and sets in motion educational forces that will not cease their working when this institute shall adjourn. These thoughts, which are brought out in your discussions, will go to the villages and homes, the granges and social gatherings all over our county, and there stimulate to further investigation, thought, and discussion, and thus prove a veritable county agricultural college in our midst.

AFTERNOON SESSION.

Mr. J. Young, of Florence, read an original poem, after which Pres. Abbot, of the State Agricultural College, gave an address on "Colleges and Industrial Pursuits."

Mr. G. Osborne, of Mendon, read the following essay on the

HESSIAN FLY.

Mr. President, Ladies, and Gentlemen:—The Hessian fly was the subject allotted to me at an informal meeting of this institute. The subject is worthy of an abler pen than mine, especially at this time, when the ravage of this pest is being felt by the farmers of this county and elsewhere. It is agreed by most, if not all, the authorities upon this subject, that the Hessian fly was imported into this country by the Hessian troops, in time of the revolutionary war, hence the name, Hessian fly.

I shall not attempt to give a minute description of this inset here, but refer you to the perfect and elaborate description given by Professor A. J. Cook, in his lecture delivered at the Paw Paw and Climax Institutes, and published in the transactions of the Michigan Board of Agriculture for the year 1877, on page 363. This book should be in the hands of every farmer and carefully perused, for it contains much valuable information upon almost everything connected with farming. It is surprising how few farmers can identify this insect, an insect which has taken thousands of dollars out of their pockets, and done the mischief in broad daylight, and right before their eyes; it shows a great lack of observing cause and effect, which should be one of the farmer's greatest studies.

Who has a broader field for the observation of nature than the farmer? Who has a better chance to study the insects and diseases which prey upon them? And yet how meagre the knowledge obtained from such observation. Every farmer should be as well acquainted with the form, size, color, and habits of the Hessian fly as he is with the damage done his wheat crop, and a few hours spent hunting for them at the right time will give him this knowledge.

My first acquaintance with the Hessian fly in this county was in 1846, when the effect of their mischief was visible in the growing wheat. I find by consulting a diary of my daily transactions in farming at that time, that in the spring of 1849, the damage done by this pest was so great that we ploughed a great part of our wheat up and planted to corn, the part left to wheat yielding eight bushels per acre; the wheat was sowed the last week in August. Many farmers thought that the early sowing of wheat would ensure it against the fly, and very early sowing was practiced for a few years, and so as to better enable us to act in the future, I will give a short history of my experience in wheat raising, taking the facts and figures from entries in my diary, made at the time referred to. In 1852 we commenced sowing wheat August 12th, and finished the last day of September, sowing in all 160 acres, yielding 13 bushels per acre. The fly had done but little damage this year, which was due, no doubt, to the cold wet weather in the spring. The ground froze an inch deep the 20th of May, and it was a cold dry summer. The wheat crop of 1853 was also a middling good one, the fly doing but little damage; the spring and summer were cold and dry; a heavy frost on the 27th August ruined the corn in many places, but we had a warm late fall, and some insects in all the early sown wheat. In 1854 the fly did a great deal of damage. (I

quote from the diary): The wheat on the ground this fall is not very promising, except upon new ground and late sown; the insects have entirely destroyed hundreds of acres. Many farmers plowed and sowed over again; the fall was warm, and frosts late, which gave the fly a chance to do much damage. The spring of 1855 was an early one; the spring birds made their appearance on the 15th of March. On the 11th of April I sowed spring wheat, and on the first of May the fly commenced depositing their nits upon it in great numbers. On May 12th they had nearly destroyed it; the yield was five bushels of poor wheat per acre. "This season," I found larvæ in every joint of the straw, and some in the heads. The season was also destructive to the wheat on account of the wet weather, which caused it to sprout and grow before it was cut; this is remembered as the wet harvest. This season tested the fly-proof qualities of a new kind of wheat, called Mediterranean; a bearded variety with large dark colored berry; it proved to be all that was claimed for it, and I have no doubt was instrumental in destroying the fly. I sowed 40 bushels of this wheat early, and (record of September 12th says), the fly have deposited their nits upon the Mediterranean wheat in great numbers. I find from 20 to 100 upon each plant, and I shall sow no more until I see the effect, (Sept. 23d) the insects do no injury to Mediterranean wheat; they go down into the plant and die. I think the coating of the leaves contain so much silicia that the larvæ are unable to get nutriment from them. This wheat became very popular, and in many localities was the only kind sown; while some would sow it early and the white wheat late, getting good crops of each, also getting rid of the insect. But I know of no wheat now raised that will withstand the attacks of the fly as did the Mediterranean.

Prof. Cook's advice to sow a strip around the field very early as a decoy, for the fly to deposit their nits upon, and in case they do, to plow it under and sow it again later, when the main army of the pests has gone, is I think (from the result shown in sowing the Mediterranean) sound, and if followed by all the farmers, would aid materially in lessening, if not exterminating for a time this great enemy. In comparing the effects of the weather upon the fly in the season referred to, we find that when the fall and spring were cold and wet, and the summer favorable, the crop was a good one and not materially damaged by the fly. The seasons of 1852 and '53 were of this character. But the seasons of '54 and '55 were favorable for them; there was plenty of early sown wheat, warm weather in the fall and spring, and the fly revelled in luxury, causing wide-spread destruction to the crop, and damage and dismay to the farmers, who were now aroused to a sense of their danger, and the question asked by every one was, what shall we do to get rid of the Hessian Fly? Some advocated feeding of the wheat in the fall and spring. Others claimed that late sowing was a sure remedy, and those who had an antipathy against the Black Mediterranean (as they called it) laid their scruples aside and sowed it, because it was fly-proof and could be sown very early. All of these modes were tried, with beneficial results.

Nature also, as if to make some amends to the farmers, favored them with cool weather. In the springs of 1856 and '57, there were frequent frosts in the month of May, which were very injurious to the propagation of the spring brood of flies, and their numbers rapidly decreased, until they were too few to do much damage. I think it is proven beyond a doubt that the fly connot propagate their species in cold wet weather, and while we cannot control the weather, we can control the sowing, so as to be absolutely certain to escape

them in the fall, and if we have none in the fall we shall have none in the spring. If the surface of the ground is rich and the cultivation perfect, and we comply with the necessary conditions to give the plant the best possible chance for a strong and rapid growth, large crops can be raised from late sowing.

In order to show the laws of nature in the growth of wheat, and the effect of the fly upon it under different phases of its growth, I have taken some plants from a field where the cultivation was uniformly the same, and the wheat all sown at the same time but at different depths. It was sown the 20th of September, and the fly commenced depositing nits the first of October.

The seed of plant No. 1 was covered half an inch deep and contains insect larvæ. No. 2, the same depth, uninjured by insects. In these plants we find the roots are of equal strength, so also are the tops, except the part No. 1, injured by insects. No. 3 was covered about one and a half inches deep, and is injured by the fly. No. 4, the same depth, injured by the fly. In these plants we do not see a corresponding growth of roots and tops as in No. 1 and 2. We also notice in No. 4 a double set of roots, which may be called the first and second roots, or the germ roots proper. The germ roots, marked A in No. 4, cease to grow as soon as the roots proper, B, are formed and begin to feed the plant from near the surface, which is usually about two weeks after it is sown. After this time the plant has two or three leaves and is the critical stage of the plant's growth, and the condition of growth which the fly prefers to deposit its nits upon, and when deposited at this time, as shown in that part of plant 3 marked B, the growth is effectually stopped, and in the efforts of nature to repair the damage she is obliged to form a new plant top, and universally begins this new one at the point of germination, as shown in Nos. 3 and 5, at point A, and no matter at what depth the seed may have been sown the new top must start from this point. In No. 4 we have a plant of equal disadvantages with No. 3, except it is injured by the fly. The difference in the growth is very marked. As a further illustration, we have prepared Nos. 5 and 6 and invite your attention to them. You will readily notice their puny growth, as compared with Nos. 1 and 2 of same age and soil. The difference in vigor and size is due solely to the difference in the depth of planting. In No. 5 you see the top is injured by the fly, and nature at once begins to start a new one. The seed was sown about three inches deep, and the new top, A, is starting from the point of germination is noticed in the preceding illustration. The new growth in this instance would probably never amount to anything, as the plant is ruined by the fly. No. 5 is uninjured. Noticing again the difference of plant growth between these and our former samples, we will pass to a general resume of the plants, arranging them in a growth. In examining this group it is a self-evident fact that the roots which support the plants, formed at a uniform depth of about one inch below the surface, provided the seed is placed at or below this point. Plant No. 1 of this group shows the roots to be formed about half way between the root line and the surface, because the seed was deposited at this point, and is a very strong plant compared with No. 4, where the germ line is two or three inches deeper.

Nature has designed a certain place for every plant to grow, according to its elements of plant growth. Therefore it is evident that in so far as we depart from the designs of nature in any of our modes of raising crops, in just such degree will we fall short of perfection. Nature has certain laws in regard to heat, light and moisture, which have the relative bearing upon the proper

germination, and consequent growth and maturity of all plants. There is a certain place at which a wheat seed should be placed to obtain the greatest amount of nature's element for its development.

When the seed has been deposited three or four inches below the surface, it will be noticed that a single upward shoot has been formed, with a few germ roots at the starting point; following the shoot from this point, we find, at a point one inch from the surface, the roots, which are destined to feed and support the growing top; the lower part eventually dies, and a certain part of the nourishment designed by nature to support the plant is lost, and a consequent backwardness of the plant is noticed. Is it not evident, then, that the point at which the roots form is the proper place to deposit the seed.

Experience for the last few years with the Hessian fly has strengthened my convictions that at this point is the proper place; ior all the properties involved in the seed for its purpose, germination, is spent in the most economical manner, and we may look for as complete a plant as the circumstances of the soil warrant; indeed, a good rich soil, with the elements of plant food in the right position for the early development of the plant, is a good remedy against the attack of the fly, and as the plant when young draws its nutriment from near the surface, the richest soil should be at this point, to secure a rank early growth, which is considered a sure index to a good crop. And this should be taken into consideration in applying manure to the soil; and the question, where will it do the most good, should be carefully considered. In this connection the question of deep plowing will arise. Now I do not want to raise a discussion upon this subject; but if I were preparing a piece of ground for wheat, and a rich top soil had been plowed down nine or ten inches deep, and a poorer one brought to the surface, I should get it back again as soon as possible and then keep it at the point where it would do the most good; in short, I would imitate nature by putting the manure on the top and mixing it with the surface soil, and the manurial elements in a liquid form will, by the aid of frequent rains, go deeper into the soil, furnishing food for the plant as roots extend, thus securing all the benefit to be derived from it.

No one would expect to grow and fatten young animals by putting their food five or six inches beyond their reach, waiting for them to grow to it, and yet it would be no more inconsistent with the laws of nature than it is to bury the rich top soil and manure five or six inches beyond the reach of young plants.

Prof. A. J. Cook gave a lecture on the "Destruction of Farm Insects." (See lectures given at more than one Institute.)

A paper, by H. N. Addison, of Leonidas, on "Farm Fencing and Stock on the Highways," of which we have not the manuscript, closed the afternoon session.

FRIDAY EVENING SESSION.

The following paper was read by Chas. Betts, of Burr Oak, on

FARM FERTILIZERS.

A beautiful connection exists between the life of man upon this earth and the varied productions of the soil suited to his support and development. His progress in thoughtful research, his skill in labor and design, his ambition to

surround himself with the means of social culture, bear a remarkable and certain ratio to the productiveness of the cultivated kingdom, of which he is the monarch and the lord. A highly developed people is nowhere found living in a barren country. Active inquiry and poor land cannot exist together, or in close neighborhood, because the power and skill with which knowledge arms the hand and directs the use of material forces will awaken the dormant energies of nature, causing the stalk to yield its grain, and the tree its fruit, even in the midst of barrenness. By means of knowledge a barren soil is quickly turned into a rich and productive estate, rewarding the hand and elevating the head which wrought the change.

Among all advanced peoples, the careful treatment of arable lands and the gradual increase of its productiveness are classed by the wisest statesmen among the primary objects of a sound public economy. Farmers who are business men,—those who are really prosperous and successful, take especial care of the soil and keep it in such a state of fertility that they are as sure of good crops as they can be of good returns from any other industry, business or employment. Throughout the domain of modern agricultural literature, controversy and discussion, no subject holds so important a place as that of farm fertility, or manuring the soil for profit. It altogether depends upon the farmer himself to say whether his farm shall grow rich or grow poor, and consequently, whether he will add to his stores or allow them to grow less and less as the earth rolls on beneath him.

There is immense danger in exclusive grain-growing, and selling it off the farm in its raw state. The farmer, like the manufacturer, should aim to put the last value possible upon everything he produces, before he ever allows it to leave his hand. The larger portion—much the larger portion—of the wheat grown in this county is sold off in its raw state, and yet, without question, the true policy of every farmer is to convert the grain into flour and retain the offal to feed more animals, for young stock and milch cows. The young animals need it to build up bones and tissues, and it should never leave the farm except in the form of meat or dairy products—these being the final result, the most valuable products that the offal of grain and that coarse provender can be turned into.

But I come now directly to the subject set down in the programme for this paper, namely, "Farm Fertilizers." And whatever I may be able to say about the materials and elements employed by the farmers of this county, and of the west generally, to replenish the waste caused by crop-growing, it cannot be half so important as for every farmer to establish a law for himself—an unalterable provision in his code of farm rules—to fertilize a cetain proportion of his farm each year in so thorough a manner that he may go through a proper five years' rotation, and have it to show that each field is a little richer at the end.

There are three classes of farm fertilizers commonly employed by farmers here to keep up their farms—vegetable, animal, and mineral. Among the first I shall speak particularly of clover and swamp muck. Clover is more important than all the other vegetable fertilizers combined, and is more generally employed for this purpose in this country than in the whole world besides, as a cheap and very efficient means of fertilizing and restoring old fields and of sustaining the vital power of those in good condition. A knowledge of the processes of vegetable nutrition establishes the facts that the atmosphere contains exhaustless quantities of carbonic acid and of nitrogen, and that the

clover plant draws largely, yes, chiefly, upon this grand and ever present source and fountain for its supply of this nourishmant. A large proportion of the nitrogen thus obtained is left in the surface soil for the use of any crop following. It is well known to all western farmers that if they can succeed in raising a good crop of clover to turn under in July or August, they are almost sure of a good crop of wheat following. Land in clover grows richer in nitrogen although you carry off heavy burdens of clover hay. In two tons of clover hay there are carried out of the soil, according to the calculations of chemists, over 300 pounds of mineral constituents and over 100 pounds of nitrogen; and yet the soil from which it was just taken if put into wheat will yield a full crop of that cereal, which also requires a large percentage of these very mineral ingredients and of this same nitrogen. This is most remarkable, and the phenomenon is apparently antagonistic and questionable. But practical farmers know that these are truths, and so also do scientific men. One thing in farming depends upon some other thing, and happy indeed is the farmer who knows just how and where this dependence exists and how to use the relationship. Clover requires the same mineral food that wheat does, the same nitrogen that wheat does, and yet it is the best crop to precede wheat with that can be used. The clover crop taken off the land is the best manure for wheat. How strange, and yet I have no doubt our scientific friends can account for the seeming contradiction and anomaly. It is found to be true that if the clover is allowed to go to seed it makes a better preparation for wheat than if mown earlier for hay. There is a larger proportion of nitrogen and available mineral matter in the soil than when the clover is fed off or cut for hay. Clover appears to bring within the reach of the grain crop a large amount of mineral matter ready for use—made so by some subtle process which science is looked to to explain. Its roots bore down into the soil and sub-soil to a great depth and breadth, permitting the air to go down also, loaded with nitrogen and carbonic acid. The roots take up a portion of the nitrogen and hold it in store against the needs of the succeeding crop, when it is given off in another form—that of ammonia, I believe. They also draw in phosphoric acid and potash until they are arrested in their intricate and inimitable work by the ruthless plow-share, which turns them up to light and heat. They decompose gradually, leaving large amounts of mineral matters, which the implements of culture distribute pretty evenly through the soil.

There is nothing in the whole range of nature's operations in connection with soil-culture so interesting, so remarkable and important to the farmer as is this clover growing as a grain fertilizer. It is better than guano for the western farmer—costing him nothing compared to the cost of guano or other commercial fertilizers and serving the purpose better. It fills the soil with available nitrogenous and mineral matters, and the more we grow the better we are off. Whether the farmer turns over a clover sod for wheat, corn, barley, oats, or potatoes he feels certain that a good crop will follow, let the season be favorable or not. As was remarked before, it has been proved by one of the agricultural chemists—I cannot now recall which one—that clover, allowed to go to seed, furnished a much larger amount of nitrogen to the soil than when it was cut twice for hay, and that a better crop of wheat can be grown in such case. The reason of this is, probably, that when allowed to ripen seed all the leaves fall on to the surface and the roots grow larger. The main portion of nitrogen left by the clover is found in the first six inches of soil. At the depth of a foot there is very little and none, or only a trace in the sub-soil.

I have thus, very briefly and very imperfectly, called your attention to this by far the most useful of all vegetable fertilizers; but I do not regard it, as some farmers do, as a substitute for farmyard manure. For that there is no complete substitute, so far as I know; but by the timely aid of clover the farmer is able, with what manure is manufactured in his stables and yards in the course of the year, to keep his farm up to a satisfactory state of fertility, and on most farms that would be a difficult thing to do without clover. It is a help to farmyard manure, not a substitute for it, and the farmer who puts his whole trust in clover and neglects to save and apply the manure from his stables and yards is a man of one idea truly, and some body will lose by so unwise a policy.

I pass now to the consideration of our swamp muck as a help, within easy reach, to the fertilizers of the farm. There is an abundance of it in almost every neighborhood. Muck, as we find it in the ordinary marshes, is not a fertilizer of itself or alone and can only be employed profitably, first, as an absorbent of liquids, and, second, as a divider of the solids of animal manures. For these purposes there is no substance or material within the reach of every farmer one-half as valuable. It is a complete absorbent of the liquids of the stables. It not only does this but, in virtue of its great absorbent properties, it acts as a perfect deodorizer and purifier of the air of the apartments where the animals are housed and kept. Clay and sand serve the same purpose, but very imperfectly. It is better to be dug awhile before using, in order to have it crumble to powder. I am speaking of pure muck, not of marl nor of the mud from the bottoms of ponds. These are themselves fertilizers and may be advantageously applied to some soils. Their value in particular cases can only be learned and determined by trial. We know that muck will absorb and hold the volatile ammonia of the liquids, because as soon as applied these cease to give off the pungent and offensive odors they did before.

Second, As a divider or extender of the manure from the stables. Muck will become, I think, the principal material used for this important purpose, as soon as farmers feel the necessity of increasing the quantity of farmyard manure. I believe that experience will sustain the assertion that a ton of muck, crumpled down fine and mingled with a ton of liquid and solid stable manure, in such a way as to absorb the liquid portions perfectly and divide the solids evenly, that these two tons, so commingled together, will be worth as much as any two tons of all stable manure, for any farm crop. If this is true, and I think there is no doubt of it, then by this means the farmer may, at a small expense, double the quantity of manure produced in his stables and yards. Unquestionably in most cases, there would accrue, from such an increase of the farm fertilizers, a large profit, provided that the muck could be dug and hauled in during a suspension of the more urgent labors of the farm, when it could be done in place of doing next to nothing.

In the class of animal fertilizers, the barnyard is the chief source of advantage. It is true that a large part of the fertilizers from the stables and yards consist of vegetable matters, but for convenience we class everything used for bedding the stock or for absorbing the liquids, under the same head with animal fertilizers.

It might be profitable, at the very beginning of this division of the subject, to give full and complete analysis of the excrements of all kinds of domestic animals, which the hard-working chemists have furnished us, but I leave that part of the subject, interesting and instructive as it is, for individuals to examine at their leisure, as they are now easily accessible to all.

Farmyard manure, properly saved and preserved under cover, is the only complete manure found, made, or produced anywhere. It is good for any farm crop; it is not over-stimulating; it is lasting in its effects. If it has been allowed to burn up by excessive fermentation, or to be rinsed and washed by rains and dried by the sun and winds, it is poor and worthless stuff, compared to that which has been rightly kept and treated. We take a field and we don't know precisely what the soil wants,—we don't know just what it lacks or needs to cause it to produce the largest crop, just the particular things to use to amend it, but we know that if we have a good lot of stable manure we can put that on and be sure of supplying what the soil needs, and that which will produce the largest yield of grain or grass. It is likely that we may add some things which the soil does not need, but there is no danger in that. If we go to the chemist with our soil and take his prescription, and get superphosphate, potash-salts, guano, blood-manure or anything else he may prescribe, what will be the result? Failure, five times in six. This thing of fertilization is not developed in a simple analysis, nor covered by any prescription. The immense, intricate and unceasing forces of nature have something to do with it,—and who can estimate them or calculate their influence? Go the world over for a prescription for a sick soil, but you will not cure it. Apply a few tons of barnyard manure and you administer a remedy which works with nature's forces. It supplies the food which any plant requires. and a shovelful is better than a thimbleful. It acts mechanically and it acts chemically also—it acts both ways—and that is what no other fertilizer will do. It has all the necessary nitrogenous properties to stimulate the plant, and it acts directly upon the soil and the plant at the same time. A dead, sterile soil feels the effects of stable manure immediately, and is aroused to a condition to produce something this year and next year. You may search the world over and you will find nothing to equal it. You may fertilize the soil with strong nitrogenous manures, such as guano—which is an animal manure, I know, but I am not speaking of that class of animal fertilizers, because we cannot employ them profitably in this part of the country—nor do we want to, either—but you apply a ton of such manure, and you get a wonderfully quickened and large growth, but you exhaust the soil. It is like putting a man into a tight workshop and feeding his lungs with pure oxygen gas. He will breathe rapidly and work like a giant, but he is soon exhausted—his strength is used up in a brief time. So it is with a soil which you stimulate excessively with powerful nitrogenous manures. Afterward, it has not the vital power it had before—it seems dead, and clammy, and crusty. These effects are never seen after an application of barnyard fertilizers.

Now I desire to say something about composting the animal manures of the farm. I know I shall be met at the outset with the quieting assurance that composting manures cannot be done here on account of the expense —the high price of labor. This is not a valid objection, it is not a business-like objection; it is a lazy man's excuse and that only. The question to be determined is this: Is composted manure better for farm crops than coarse, unfermented straw and excrement? Any practical farmer, I think, will admit that it is. And, further, I think that farmers will agree with me that a cord of well composted and decomposed manure will go farther and produce more than two cords of the coarse, indigestible stuff hauled out from the yards. And further than this and more important than all, by composting with muck in the stables the liquid excrement, the richer portion, is almost entirely saved,

whereas if muck is not used this very valuable part is almost entirely lost. This important consideration settles the whole question of the profitableness of composting animal manures. I might again introduce here the ample analysis of agricultural chemists to show the great value of the liquid excrements of all animals, but that would be unnecessary. Every reading and observing person knows their value, and knowing it, who can tell why farmers do not take measures to save so rich a fertilizer and avoid this large yearly loss? I beg to say to the farmers of St. Joseph county that right here there is an immense leak in your business. You feel the want of richer fertilizers and of a larger amount of them. Here you have the very thing—only save it. If the extent of your business operations precludes the employment of the farm force in digging and hauling muck, reduce the area of cultivation for a time and thus be able to appropriate the necessary labor for the purpose. There is nothing in farming better established than that by high culture we may grow as much as we now do on less land than is now occupied with crops.

When yard manure is composted and decomposed, all the really valuable elements of crops, that is, the food which crops require, is ready for immediate use. As soon as the seed puts forth a tendril, the nourishment it needs is at hand and the plant springs into a vigorous young life immediately. But if the manure is used in its raw and rough state, the young and tender rootlets cannot use it.—They must wait for the decomposition to take place which should have been affected in the yard under cover.

Now let me say a word or two about covering manure to preserve it from the wash of rains and snows, and from drying in sun and wind. We haven't got to this much in practice in this county, but farmers will come to it by and by, there is no doubt of it, for there is profit in keeping manure under cover. You convince a farmer that there is money in any certain operation, and he will at once test the thing for himself; and when he has tested it and found it right, he never goes back. So I know if the farmers of this county will try covering the barnyard manure once, they will not leave any more exposed to the weather. I was reading, a short time since, an extract from an English paper giving an account of the covering in of the entire barnyards on a large estate in England. The cost was about $5,000, the owner advancing $4,000 and the tenant $1,000. Such an expenditure for this purpose was never known in this country. Indeed, even cheap shelter for the manure thrown from the stables is extremely uncommon. I once visited the farm of a well known wheat grower and model farmer in Oakland county, Mr. Linus Cone. This was in August, and he took me to his stables to see some manure which he was having hauled out on a barley stubble to be plowed under for wheat. He had been feeding some steers the winter before in box-stalls about six feet by ten, and the manure was still in the stalls without floors. The men were cutting it out with sharp spades, four inches thick at a cut. It was about a foot deep. Mr. Cone calculated that one load of that manure was worth three loads of common barnyard manure which had been exposed through the season, and I could not question the value he put upon it. No portion of the salts had been washed out, and fermentation had been very gradual, apparently, so that there had been no loss and all the ingredients of the manure were there. He was spreading it very thinly and it went a long way—it was very rich.

It is apparent to every observer that a large portion of the excrements of animals on the farms of this county is lost, so far as the enriching of the soil is concerned. That of pigs, sheep and poultry in particular, is of little practical

availability in the work of enriching the farm. Some more sytematic methods of preventing this constant waste is demanded by every economic and business rule. Would it not be very near the truth to say that half the animal fertilizers in this county are annually wasted by exposure, by the want of absorbents to take up the liquids, by over-fermentation, by the washing of rains, and by excessive evaporation in sun and wind, and by allowing animals in winter to occupy large yards, so that their droppings cannot be collected and saved?

Leaving out other animal fertilizers, which are seldom employed here for the purposes of fertilizing the soil, I pass to the consideration of ashes and plaster as farm fertilizers. The analysis of wood ashes shows them to be of great value for some crops. We know them to be, without the analysis, as they are a result of veritable growth and decomposition. They contain potash, soda, lime and phosphoric acid in large proportions. As a manure for potatoes, I consider ashes almost indispensable, and they are very valuable to top-dress old meadows with, extirpating mosses and weeds and aiding the growth of the better sorts of grasses.

Plaster is too well known to require more than a passing notice. Every farmer in the county uses more or less of it annually upon clover fields, and this is the chief extent of its use as a fertilizer. It is, however, a valuable fertilizer for both corn and wheat, and also for potatoes, but for these crops it should be sown before plowing and mixed with the soil. It appears to be useless as a top-dressing except on clover. It would well repay the farmer to use it about his stables and manure heaps freely, to absorb the escaping ammonia and keep the air pure.

Common salt has very little value as a fertilizer. It is never found in the seeds of grains, nor as a constituent of any part of any plant. It is sometimes found in the juices of plants, from which it may be washed out. If it was a fixed constituent of the plant, like potash, it could not be washed out. It appears, however, to aid the growth of the plants slightly in some instances.

I have thus barely glanced at some of the farm fertilizers which are within the reach of farmers in this part of the country, knowing that the time of the institute would not allow an extended discussion of the subject. The questions involved are of the very highest importance, especially the saving of the liquids of the stables, the protection of the manure from rains, and composting. Year by year we see more and more the necessity of greater care of the soil. The business of farming is a vast and intricate one, and needs the farmer's best business talent. His constant aim and purpose should be to make his soil more productive without an increase of manual labor. If he does this, and lives within his means, he may defy changes in the currency and financial panics, and live on in happiness and comfort, a free and an independent citizen.

Chas. W. Sheldon read the following paper on

OUR AGRICULTURAL COLLEGE.

The world moves, and every page of its history is adorned with the word progress; but in the cultivation of the soil, in the enhanced enjoyment of life, and in the elevation of the calling of the farmer to that higher dignity, we find that agriculture has not kept pace with her sister callings in the grand march of improvement. What is the cause of this? Not because we think so much, but because we think so little,—because we have not recognized the truth that "knowledge is power."

In former times muscular strength was regarded as all important. Then the heroes and great men were those who like Hercules were able to astonish the world with muscular feats. But we of to-day recognize that the high road to achievement, greatest power, and happiness is through a well disciplined mind. In other professions than that of farming men have always recognized the fact that they must educate themselves if they would make a success, but not so with the farmer, for the general opinion has been that any man knew enough for a farmer, but the man that thinks so to-day had best keep silent lest his "braying betray his ears."

Do we all admit that "knowledge is power?" If we do, then we must admit that the want of knowledge is weakness. If this truth applies to any calling, it surely does to that of the farmer. Isolated from his fellow men, he has not the facilities for cultivating quick perceptions and logical thought that those have who are more closely associated. The determining of correct systems in agriculture is more complicated than in any other business. The farmer needs to know what to do, how to do, and why. Liebig says there is no profession which for its successful practice requires a larger extent of knowledge than agriculture, and none in which the actual degree of ignorance is so great. We know too little in regard to the wants and conditions of demand and supply. We depend too much upon what the buyers of our products tell us. We should know for ourselves.

In the social and political scale we go up too quick, constituting as we do fifty-two one-hundredths of the population. If we possessed the proper requisites, we would exert an influence for good, and one that would be felt. Sons of farmers would not be so willing to forsake the calling to become wearers of stove pipes and dealers in needles and pins, but would see in the calling of the farmer equally alluring prizes in the shape of honor, influence, and wealth. If we would raise our social and political standing, we must give more dignity to labor and learn to think and act for ourselves. The question arises how is all this to be accomplished. In one breath, we all answer, by education.

To many the way is through the newspapers and periodicals, through farmers' clubs, and through the grange.

We have to lament that Michigan, the leader in agricultural education, has but one paper, the Michigan Farmer, devoted wholly to the farmers' interests, and it is claimed that it would die in less than a year if other interests than the farmers' did not come to its aid.

In other counties of the State farmers have united and formed clubs, some of which have gained for themselves an influential name, such as those of Mason and Romeo. But St. Joseph county, far above the average in soil, wealth, and I hope in ability, does without. The grange, an organization for the farmers' improvement, affords an excellent means. Because a few years ago you heard so much of the order when everything was all excitement, and because everything to-day passes along without noise or friction, do not think that it is dead, for if you will join its ranks and exert your little influence, you will find it to be the liveliest corpse you ever beheld. But to the younger class, to the growing and coming generations, there is another means.

This is by getting an education at our college,—the farmers' college.

This college was established in accordance with an act of legislature of 1855. They appropriated, for its benefit, twenty-two sections of land, given to the State while yet a territory by the general government. In 1863 it accepted the congressional grant of lands, amounting to 30,000 acres of land for each

senator and representative in congress. The college was opened to students May 13, 1857.

Thus began the pioneer agricultural college of this country under many of the most adverse circumstances one could imagine. Built in an almost wilderness, surrounded by dismal swamps, twenty miles from any railroad, the large farm which belonged was almost in a state of nature; the legislature deeming it an experiment were afraid to be liberal for fear of its failure and barely gave it enough to keep it alive, proposing to give it a liberal endowment when it should prove itself a success, or, in other words, saying, "When you can support yourself we will help you." No guides were offered from which to choose a course of instruction, and the whole policy and discipline had to be gained by its own experience. Many people, especially the farmers who should have been its patrons, looked upon it in disdain. Many objected to it on the grounds of cost, not stopping to think that it was the design of the college to increase their earnings and enjoyments and to elevate the calling to that higher dignity to which it belonged. Many asked, with a defiant air, How can you teach a man to plow and hoe and to do the practical work of a farm? Now it is not the object of the college to give the student a complete education in the daily work of a farm, for the short course of four years would be insufficient to carry it out and give the student, at the same time, the more important part. Many objected to it because they did not like the idea of book or scientific farming. Too general was the false idea that the scientific farmer was one who went afield with his mouth crammed full of hard words, his coat-tails stuffed with learned treatises, and his hands filled with gallipots from the drug-store with which to make senseless and profitless experiments. Much of the feeling against science as applied to agriculture has, without doubt, grown out of a wrong understanding of what is meant. "Science is a knowledge of facts, events, or phenomena as explained accounted for or produced by means of powers, causes, or laws," and science, as applied to agriculture, is simply a knowledge of and conformity to nature's laws. Now it would sound strange indeed to say that success was the offspring of ignorance, or that a farmer would unfit himself for his calling by conforming to nature's laws.

Another source from which much of the abuse that has been heaped upon science and its teachings comes on account of those who have much book learning and less wisdom and experience. Many of you have heard of the tanner who had for a sign a calf's tail drawn through a knot-hole over his door. He had noticed several times a studious looking man, with gold eye-glasses and cane, intently looking at the tail hour after hour. One day the tanner accosted him and asked, "Do you wish to buy some leather?" He replied, "No," and continued to observe the tail. The tanner then asked, "Have you hides to sell?" When he replied, "No; I am a philosopher, and am trying to satisfy my reason how that calf got through that knot-hole." Do you wonder that such men, claiming to be scientists, should bring contempt upon science in the eyes of the ignorant who do not recognize that his teachings are those of ignorance instead of science.

The objects of the college are—

First, To give a knowledge of science and its application to the arts of life. Those sciences are especially made prominent whose teachings are useful in the improvement of agriculture, as chemistry, botany, entomology, physiology, etc. These studies are much longer dwelt upon than in other colleges where their object is not to apply the teachings of science to an art. Here the

student gets experience in applying the teachings of the various sciences to the affairs of every day. In chemistry he must analyze upwards of one hundred substances in accordance with the previous teachings. In stock breeding he must estimate the valuable points of stock till he can do so knowingly. In entomology he becomes acquainted with the beneficial and injurious insects by observation and analysis. In apiculture he takes care of bees. In surveying or leveling he gets actual practice in the field. In short, all the lessons taught indoors are illustrated by actual practice outdoors.

Second, To prosecute experiments for the benefit of the farmer. The art of agriculture is to be improved by experiment, and here every facility is afforded so that they may be conducted from year to year with as little error as possible. The student here gains an insight into the art of experimenting which must ever be the great source of improvement.

Hear what Joseph Harris, author of Walks and Talks, says: "As a rule, the experiments at our agricultural colleges have been of little interest or value. But the Michigan Agricultural College is a bright exception to this dark picture. It has made some most important experiments. They have been planned with great thought and after patient investigation. They are not haphazard experiments, they are made with a definite object. They bear marks of scrupulous accuracy. Nothing is covered up, nothing omitted. They are not pen and ink experiments. No one doubts their entire trustworthiness. They are not common experiments such as any of us can and ought to make on our own farms, they are scientific experiments."

Third, Here a young man with but a small purse can get for himself a college education. At most colleges a four years' course costs from $1,500 to $2,500, but here the average cost to students is about $700. Here many a student, with money enough to pay the first year's expenses, from $50 to $75, if he is industrious and saving, can complete the full course with what he can earn. There is a compulsory labor system connected with the college by which each student is obliged to work three hours per day, except Saturdays, for which he receives seven and one-half cents per hour, if he is faithful; he also has the privilege of working extra time certain afternoons and Saturdays, for which he receives twelve and one-half cents per hour. The board and washing are furnished the students at cost. The past year the board was furnished for $2.27 per week. The college terms are so arranged that the long vacation comes in the winter, when most of the students devote their time to teaching district schools, thus replenishing their purse to pay the coming year's expense.

Fourth, A student also gets that general training, from other studies and from his contact with professors and students, which gives him culture, making of him an intelligent and useful citizen. The student here gains a love for the beautiful in agriculture; he goes home enabled to see more of the bright side of life.

Fifth, A system of manual labor is connected with the college and has many advantages. As I before said, it is compulsory; three hours' work is required on all days except Saturdays. Students are paid for their labor according as it is faithful. This labor system encourages the student to respect labor, and not to look upon it as degrading. He here forms habits of industry which he will carry through life It gives him that exercise which is essential to the maintenance of good health. The labor is planned in as much as is possible to illustrate the principles taught in the class. Students are not kept at that work which they can do the most of, but are constantly changed so as to give

a variety, so as to give them some insight into all the operations of the farm. The object is to educate the boys so as to return them to the farm. At this age, when habits are so rapidly formed, were they to study without labor, they would seldom recover the disposition to perform the duties of the farm.

It is often asked what becomes of its students. Many cry out that it is a failure because its students do not come forth as a solid phalanx of farmers. They do not stop to think of the difficulties. The students as a majority come from the poorer walks of life, and we are all aware that to enter the occupation of farming much more capital is required than in the other occupations. Many graduates expect to make farming a business, but are compelled for the first few years to teach or enter other occupations where less capital is required and where the profits are larger than those of farm hands. Statistics of other colleges show that but few of their graduates ever go to farming, and that many that are educated in special schools, as in medicine and law, in the end adopt some other business. Of their graduates they tell us that only one and one half per cent go to farming. Many of the best institutions fail to send any. Harvard for twenty-four years failed to send one out of over six hundred, Dartmouth out of twelve hundred, and Ripon college for eight years failed to send one. But our college, on the other hand, including the class of '75, had one hundred and twenty-four graduates, four of whom are dead. Of the balance, forty-two are farmers, seven fruit culturists, one apiarist, eleven professors and instructors in agricultural colleges, ten are engaged as students in special sciences, as engineers and mechanics, all of which pursuits are supposed to be in keeping with the teachings of the college, thus showing that over fifty per cent of its graduates practice what they are there taught, and over forty per cent return as actual tillers of the soil. Not only is this true, but every graduate, in whatever occupation, is found to be in sympathy with the farmer, and will ever act as an ally in the camp of others. Aside from the graduates there is a much larger list of students that take up a special course, and many that come for one, two, or three years and then are compelled to quit, they will exert a silent influence aiding the cause wherever they are.

Friends, to-day we can say that progress is stamping itself upon the history of agriculture. What a change—how great is the opportunity which is afforded your sons to-day which formerly you might have sighed for in vain. At our college, the farmer's college, your sons can get a free education, fitting them for one of the noblest callings of man,—here they will learn to love labor, and not despise it, here they will gain for themselves a strong and healthy physical development nowhere else to be had, here they will get that culture and education which will better fit them for citizens of this free republic, enabling them to better perform their duties and promote the real interests of themselves and their fellow men. Let us congratulate our college for its prosperity and eminent success, and may its power to do good ever increase and never grow less.

Mr. Chas. Palmer read the following essay on

RECLAIMING MARSH LANDS:

MR. PRESIDENT:—At the organization of this Institute in December last, I was chosen to prepare and read an essay upon marsh lands, their drainage and cultivation. Very many farmers there are whose years, experience, and observation would have rendered them better qualified to come before you with principles and suggestions upon the subject of drainage than myself; but inas-

much as I was selected, without my knowledge, I will try to furnish a few of the elementary principles connected therewith.

This subject is one which is of an entirely different character from any other branch of agriculture. Stock raising is carried on more or less extensively by every farmer. The produce of different kinds of grain, fruit, and vegetables is equally extensive; and the various theories for stock raising and their proper management and care, the different modes of producing from a variety of soils, the different kinds of grain, fruits, etc., are subjects of constant discussion through the agricultural journals. But the drainage of swamps, marshes, and other low lands, and their successful cultivation, especially in this county, is comparatively a modern theme, and but few farmers have been successful in their enterprise. The reason for the failures in very many instances I shall attempt to explain.

I shall not weary your patience by reading to you the copies of various agricultural reports upon the subject, nor shall I undertake to furnish you with the correct chemical analysis of the substances which taken together constitute a marsh, for you all know that the principal difficulty and greatest objection to it for cultivation is the presence of too much water. But very few people whose interests are not directly connected with agriculture or its products have any realizing sense of the effect of a wet or a dry season upon the aggregate wealth of the region in which it prevails. They hear that rain is wanted in the country, or that the crops are suffering from continued wet weather; and they dismiss the subject by saying that the farmer is never satisfied. But few of them are aware how much such expressions convey to the mind of the man whose means of subsistence and whose labor may be wholly destroyed by a superabundance of rain. It is the farmer who suffers, and he is able to stand it, they say. If then so great a loss is sustained in a single year from an excess of rain, what must be the effect upon the man whose farm is from one-quarter to one half under water at all times, by reason of a swamp or marsh. If a farm of 160 acres of good tillable land produce to the owner $800 or $5 per acre profit, and an adjoining farm of 160 acres be one-quarter marsh which produces nothing to the owner, then it is easy for us to see that this farmer has sustained a loss of $200 in a single year by reason of said marsh, and very many there are in this county in just that condition, which have been under cultivation for forty years, aggregating a loss to the owner of $8,000, and the marsh on hand yet. Would it not be wise and profitable for the owner of that farm to expend in reclaiming said marsh even three times the annual profit per acre, or $600, which will in nine cases out of ten successfully drain a marsh of that extent, and render it the most productive part of the farm, for all farmers who have had any experience in reclaiming low lands will testify that they produce more grain and hay and are the easiest cultivated of any part of the farm. A single instance will show something of the productiveness of a reclaimed marsh on the farm of Lay Pemberton in this township.

I, Lay Pemberton, do hereby certify that in the year 1872 I harvested and threshed eighty bushels of good marketable wheat from one and three-quarter acres actual measurement, it being the first crop of any kind of grain ever grown on that piece of ground, for it was formerly under water all the year round, and that said piece of reclaimed marsh still retains its productiveness notwithstanding the successive dry seasons.

[Signed] LAY PEMBERTON.

Many unsuccessful attempts at drainage have no doubt come under the observation of every farmer present, and I presume there are some here who have

attempted to drain a marsh, and bring it into conditions of productiveness, who have absolutely failed in the attempt. The reasons for such failure I here venture to assert, are that in nine cases out of ten, the work is not properly done. Many men who undertake to reclaim a marsh will in the first place construct a ditch around the outside of it, without any regard to fall; and down hill, through high ridges, and ravines, all the same size and depth; and the dimensions of their ditch will be about two feet wide on top and two feet deep, with banks nearly perpendicular, and then they say they have drained their marsh. We have only to wait until after the first winter is over, then inspect their ditches and ask them if drainage is going to be profitable, and their answer will invariably be in the negative. Such attempts at draining marshes may be seen in all parts of this county. The reasons for failure are, that the small shallow ditches fill up with mud or water, and it matters but little which, for if a drain is full of water the object to be attained is very close to a failure, because the water in the adjacent soil is just as near the surface as it is in the drain, and although the drain may be working well, yet, the perfect draining of the marsh cannot be obtained for want of proper depth. I desire to say here, that there are some marshes and swamps that can never be reclaimed, because their location is so low that their is no suitable outlet, but nine out of ten of all the marshes in this county have desirable outlets and can be drained and made tillable, productive, and profitable land, if the following principles of drainage be carried into effect: First provide a suitable outlet; and secondly, construct the drain, if in muck or marsh land, not less than four feet deep, with a slope of bank not less than one foot on each side to one foot rise, and not more than one foot or one foot and a half wide on the bottom, according to the quantity of water to be discharged; for experience has shown that a narrow drain will carry off a given quantity of water in a shorter period of time than a broad bottomed drain. The proof of this will be seen when we compare the two. The water in a broad bottomed drain will spread over the whole surface, or it will meander from one side to the other, forming bars and eddies, pile up heaps of sediment in the drain, or wash under the bank and cause it to fall in, thereby making it necessary to clear it out frequently, while the same quantity of water will pass through a drain of one-half the width of bottom, and cause a strong current to run straight and carry off all sediment, grass, leaves or other obstructions, keeping itself clear and always down to its original depth, thereby obtaining the constant and unnecessary expense of cleaning and deepening. The subject so far treated relates more particularly to marsh lands, and not to low clay bottoms or other swamp lands having a solid earth bottom and being too wet for cultivation. Their treatment and permanent cure will be considered more particularly under the subject of tile draining.

After a marsh is properly ditched, the first thing to be done is to break it up and try to subdue the wild turf or sod, which should never be done in the spring of the year, except it is to be sown with oats, which, in a dry season, is a very good beginning. But, generally, the best way is to plow in June, just before or immediately after harvest, then harrow thoroughly, and allow it to remain in that condition through the hot weather of July and August. If intended for wheat it should be sown early, for there is no danger of fly troubling it and it will get a stronger top and root and is less liable to heave, a difficulty of frequent occurrence on newly reclaimed marsh land.

I will call your attention to the subject of tile draining. I would not recom-

mend the laying of tiles in muck, in attempting to drain a marsh, for the following reasons: First, that a greater quantity of water has to be got rid of for the first two or three years, or until it has become solid, than afterward, it therefore requires greater capacity than could be obtained in a tile drain. Secondly, tiles laid in muck without a solid foundation, would be quite likely to get out of place, but in clay bottoms, swamps, or any low land where solid bottom can be reached, tiles are preferable, for tile drain properly put in will be a permanent improvement. In laying tiles, great care should be taken to provide a suitable outlet, then, for all ordinary farm drainage, the expense per rod is but a trifle more in the first instance than an open drain and performs its work more perfectly, for it never fills up, and there is no bank or ridge to settle down hard and form a levee, keeping water out of the drain, but on the contrary it creates a filter through which the water can readily pass into the tiles, for it will not harden even the most tenacious clay, and becomes arable and light and easy to plow and capable of being moved earlier in the spring and and sooner after heavy showers. In fact it makes valuable land out of low, worthless bottoms which farmers plow again and again, never realizing anything for their labor but drowned crops and weeds.

If the farmers who have this kind of land would universally underdrain, it would pay for the investment a hundred fold, not perhaps in a financial point of view, but in beautifying their homes and advancing the value of their farms, by making them more productive with the same outlay of labor, and, lastly, carrying off a vast amount of stagnant water, which would otherwise engender malaria and poison the surrounding atmosphere. At the present time we have two practical systems of drainage in this State. First, individual drainage, where the farmer is always repaid when thoroughness and ordinary skill are employed in the work. If time and space would permit, we could name many instances of individual drainage where the improvement to the land alone has been remunerative to the owner, and we have no doubt but that many of our farmers would engage in the work the coming season, were it not for the scarcity and high price of good material. The other system is what is known as the township drain law, which, like all other public beneficiaries, has its opponents among whom are men of high standing; more especially the taxpayers who are fortunate enough not to own any low land. Yet, by the aid of this law, we have succeeded in opening a great many drains through long chains of marshes, which without the aid of the law could never have been accomplished. Thanks to the Michigan legislature for the creation of such a law. While we are willing to admit that in some instances individuals are excessively taxed, or do not receive the amount of pecuniary benefit they should, yet indirectly they are repaid for the investment, for the effect of drainage upon the health of a community is strikingly apparent. It is universally conceded by physicians that the decomposition of vegetable matter, filling the atmosphere with malaria, is the chief cause of bilious diseases; and it is a well known fact that intermittent and remittant fevers have very much diminished of late years; fully fifty per cent, the physicians tell us. Many of you well remember that among the pioneer settlements of Michigan, especially in this county, ague and bilious fever were prevalent, that at times there were scarcely well enough to take care of the sick. Take this fact in connection with the then condition of our marshes, and the newly broken soil, and compare them with the present, and the greatly improved state of the public health, and the inference is forced upon us that they bear the relation to each other of cause and

effect. Where there is decomposition of vegetable matter, where there is a decay of logs and grass and roots abundantly going on, there you will find billious diseases of all grades, from the dumb ague up to the almost inevitable fatal congestive chill. Now physicians tell us that a genuine case of ague is seldom seen, that congestive chills caused purely by malaria are never met with, and some M. D.'s even go so far as to say that there is no such thing as a bilious fever, about which, had they practiced here thirty or forty years ago, they would not have been so skeptical. There must always be moisture in connection with dead vegetable matter, or there is but little poison evolved. Where decomposition goes on so slow as it does in dry matter, it does not affect the atmosphere to any great extent. These are facts in chemistry; it is reasonable to conclude, therefore, that if we keep these low lands drained,—if we keep this rank vegetable growth from decaying, by depriving it of moisture, and annually cut it off and convert it into the wants of husbandry, we thereby beautify our farms, enrich our granaries, and most important of all, secure to ourselves and our families that greatest of all blessings, good health; and according to the old philosophers, good health alone is man's imperial bliss. Now all this has been the experienced result in our own community of our practical system of drainage. The result has certainly justified the means, and the expense of the enterprise has been the best paying investment that any community could possibly engage in. It is difficult to estimate the expense of sickness, and it is impossible to compute the loss of a single life, so laying aside all considerations of profit and loss, it pays in a hygienic point of view. Such is the concurrent testimony of all observers, and the verdict of every physician's ledger.

If then the wealth of a whole people is so greatly benefited by drainage, (which no one attempts to deny), then would it not be just, right, and lawful for the whole people to aid, by taxation, in reclaiming some of the large tracts of low lands which can never be drained by individuals or by the aid of the township drain law. (The kind of drainage to which I allude is the deepening and straightening of all streams the two termini of which are within the county.) Take Portage Creek in Mendon and Spring Creek in Nottawa, and similar streams in nearly every township in the county, having a continuous chain of marsh, miles in length, the undertaking would be too expensive for individual owners to bear. I ask you here to consider the propriety of securing to yourselves such legislation as would authorize the board of supervisors of this (or any), county to appropriate from the general fund of the county a sum not to exceed one thousand dollars in any one year, to be used in connection with a fund collected from the land owners, thereby providing ample means to carry on a general system of drainage very much needed, and when once in successful operation would never require repairs, and a vast amount of land which now abounds in vermin, reptiles, quagmires, and biliousness would soon become valuable, and the increased value upon the assessment rolls would soon replace the appropriation. I leave this suggestion for your earnest consideration, and having gone briefly over the subject and touched some of the leading features connected therewith I leave it with you, hoping that your interest in humanity will induce you to push forward the work already begun until you have reduced every marsh to a cornfield and every swamp to a meadow.

After a vote of thanks to the State Board of Agriculture for appointing an institute at Centerville and to the members of the college faculty for their lectures and addresses, responded to by Pres. T. C. Abbot, the institute was declared adjourned.

BAY CITY INSTITUTE.

Held February 4 and 5.

Bay City manifested a lively interest in the Farmers' Institute. There were a goodly number in attendance, both of farmers of the vicinity and residents of the city. The Press of the city, the Courier and Herald of East Saginaw, and the Saginawian were represented.

On the arrival of the delegation from the College, consisting of Pres. T. C. Abbot, Professors R. C. Kedzie and R. C. Carpenter, and R. G. Baird, Secretary of the State Board of Agriculture, they, together with the members of the press were handsomely received at the depot by Judge Marston, Mayor Lord, ex-Mayor McDonell, Gen'l B. F. Partridge, Messrs. Lewis, Merrill, Gustin, Fitzhugh, and several other leading citizens.

They were driven at once to the Frazer House, where they sat down and did justice to a sumptuous dinner. Carriages were then in waiting and they were driven to Mr. Thomas McGraw's farm, on Center street. Here they witnessed the operation of cutting and steaming feed for some ninety head of cattle that are being fatted. This is a model establishment, and shows what can be done in the way of stock-farming in that vicinity. The party drove to Mr. Wm. Westover's farm, but on account of the storm they remained but a few minutes, and then returned to the Frazer House.

The sessions of the Institute were held in the court-house, and presided over by Hon. Isaac Marston, President of the Bay County Agricultural Society. After prayer by Dr. Wight, and vocal music by a double quartette, ex-Mayor McDonnell delivered the following

OPENING ADDRESS.

Ladies and Gentlemen:—Whatever may be the result of the meetings which we are about to inaugurate, in point of instruction to ourselves, it must be admitted that it is a source of pleasure and satisfaction to us, as citizens of this county, that we have so far become recognized as an agricultural community as to attract the attention of the Board of Agriculture of our State.

During the period in the history of our Valley, when our vast lumbering and salt enterprises monopolized all our labor at remunerative prices to the employed, it was but natural that our farming interests were left to languish and the capabilities of our soil left untested.

But in part, attributable to the late general depression that pervaded all our industrial and manufacturing pursuits, and in part owing to the efficient efforts and untiring energy of the gentlemen who have had charge of the agricultural society of our county for the last two years (and were I not so extremely careful about other peoples' modesty I should say) and largely owing to the indefatigable industry of the president of our agricultural society, Judge Marston, who is rapidly running into grangerism, things have changed. Bay county has become noted for the richness and productive powers of her soil.

We read the statistics of our State and find recorded, that although we are few in number of cultivated acres, we are large and bountiful in the quantity of yield, and, indeed, in some products, second to no county in the west. So, the industrious and honest granger who, while looking around for a new home-

stead, reads in his morning paper an account of our annual production of six hundred millions feet of lumber and eight hundred thousand barrels of salt, must not take for granted that our soil is either too piny or too salty to produce cereals and vegetables. The light of day then, having already entered where the giant oak and whispering pine once stood in their native majesty, and our county having already been accorded a place in the sisterhood of agricultural counties of our State, it certainly now behooves us to avail ourselves of every benefit and all the immunities that we, under the law, as an agricultural community, can receive. Prominent and foremost among those advantages is the information and advice we acquire from gatherings of the character we are here to organize.

The wisdom and foresight of those who framed the organic laws of our State, penetrated the necessity and influence of "farmers' institutes," courses of lectures and readings and interchange of opinions, by which adults as well as youths might acquire instruction in agriculture, and to this end our State constitution has provided that our State Legislature should encourage the promotion of intellectual, scientific and agricultural improvements, and that the Legislature should at as early a day as practicable "provide for the establishment of an agricultural school;" and we find that in obedience to this constitutional injunction a "State agricultural school" was established during the legislative session of 1855, now known as the "State Agricultural College," and the design of which has been and is to furnish thorough instruction in agriculture and the sciences connected therewith, and "to teach such branches of learning as are related to agriculture and the mechanic arts."

Under this original act the Agricultural College and farm were located, and the institution was placed under the control and management of the State Board of Education. For 1861, however, an amendment was made to this law and provision was made for a State Board of Agriculture to which the control and management were transferred as a distinct body corporate, with all the powers usual to ordinary corporations.

By the provisions of the law the State Board of Agriculture is authorized to institute winter courses of lectures, and instruction for others than college students, subject to such rules and regulations as the board prescribes.

In the exercise of this authority or privilege the agricultural board, aided by able members of the college faculty, commenced giving series of outside lectures in different parts of our State some three or four years ago, and the reader who has paid attention to the proceedings of these institutes found himself richly rewarded for his pains.

Our county, then having received recognition as an agricultural field for these honorable scientific missionaries, and they being gentlemen of eminent learning and wide practical experience in scientific subjects, about which the great majority of us are comparatively ignorant (but some knowledge of which would seem to be very necessary to those of us who pursue a farm life); let us give them a warm and cordial welcome, in a manner in which I feel warranted in saying they will appreciate; namely: by a full attendance at every one of these morning, afternoon and evening sessions.

No one who is the possessor of a single city lot in any of our cities, can afford to say that he or she has no interest in these institutes. It does not require much of a prophet to determine that much of our future as cities, depends upon our agricultural developments. Our manufactories are diminishing in number rather than increasing, and at two dollars per thousand feet for

a saw-bill, you will not see many new investments made in saw mills. With salt only seventy cents per barrel, you must not look for a rapid increase of salt wells, except as incident to saw mills.

It must not be forgotten that hitherto the growth of our cities has been mainly dependent upon these two great factors, lumber and salt. As they prospered our cities expanded and our business flourished; as they languished our cities made no progress and business became stagnant.

In the light of this experience it would seem as if the duty of every good citizen was well defined. The elements of progress and prosperity are still within our grasp. Shall we co-operate and make use of them?

The characteristicts of a farm life are so diversified and numerous, from that of the gentleman farmer, who examines his stock with his kid gloves on, down to the toiling ditch-digger, that it is hard to conceive of a taste or an appetite in the individual but what can be satiated.

Between the felling of the huge forest trees or the planting and hoeing of potatoes and corn and up to the importing of Jersey thoroughbreds and Percheron Norman full-bloods, there are many intermediate grades of industry to tickle the fancy of the fastidious, as well as to indulge the cravings of the miserly.

But, ladies and gentlemen, I do not mean that we all should become grangers—I simply insist that a great many of our citizens could, without interruption of or interference with their particular professional, mechanical or business employments, own and cultivate or cause to be cultivated a small farm if not a large one, and thus aid in building up our cities and counties.

On behalf of the farmers of our county let me extend to the gentlemen who have come to aid us from outside of our county, their earnest welcome, and on behalf of our citizens residing within our two cities, let me assure all of our guests that we welcome them to our midst, and we hope you will find your association with our citizens as pleasant and agreeable as we feel confident your presence will be beneficial to us.

President Abbot, of the Agricultural College, gave an address, setting forth the courses and methods of instruction at that institution.

The Bay City Tribune gave the following notice of the address:

President Abbot was introduced and delivered an interesting and practical address upon "Manual Labor in Colleges." He described the plan adopted at the college, of combining manual labor on the farm with the study of the science of farming, explaining why the plan was adopted, and showing by numerous incidents and instances that the course had proved to be a wise one. The general plan of instruction, practical in all its details, was narrated, and it was particularly dwelt upon that practice makes perfect, that empirical rules will fail; that greater confidence is always reposed in those of the professions who have experience as well as theory at their command. The admirable point was clearly made by the speaker, that in the course pursued at the college the students lived among their studies and thus mingled study and life. The closing remarks were upon the necessity of the work in order to be a successful farmer, and it was related that of all the students who had attended the institution in twenty years there had been but one who did not take a lively interest in the work of the farm. The time each student is required to labor upon the farm is three hours each day,—they thus gain a practical knowledge as well as intellectual improvement. The remarks were enlivened by the rela-

tion of facts proving the correctness of the theories, and by the earnestness manifested by the speaker, evidencing that he had the subject at heart.

A letter from Hon. James Birney, U. S. Minister at the Hague, was read by Judge Marston, on

COWS IN HOLLAND.

Some writer has said of Holland, that it is "the paradise of cows." If to have plenty to eat, water alwas convenient for drink, beautiful pastures in summer, warm housing in winter, kindness and good service on the part of the masters, makes the paradise that cows covet, then they certainly have it in Holland. Their range is upon fields perpetually green with luxuriant grass. The saline atmosphere that is blown over them from the sea whets their appetite and promotes their vigor. They are distressed neither by the sun of midsummer, nor by the frosts of winter. When the chilling blast of the short days assail them they are snugly stowed away under the same roof that shelters their keepers. The few notes I propose to jot down about them, will first describe their species, and then mode of treatment.

A small number of Holland cows have been imported into the United States, and at the fairs where they have been exhibited have been called *Holstein*. This is a mistake, and has occurred through inadvertence that does them injustice. They are, as a breed, much superior to the Holstein, a kind reared in a portion of northern Germany. "They would be correctly called *Frisian*, for the reason that they originally came from Friesland, one of the states of Holland." At a very early period a colony of Dutch, taking their cattle with them, migrated to England and settled upon the river Tees, which borders upon the county of Durham. The Durham cattle had gained no distinction until after this event, and it is supposed that a cross with the native cattle of that vicinity and the Holland, produced the Durham. Although the Durham branch of the bovine family has gained great acceptance, yet it has been bred latterly more with reference to symmetry of form and for beef qualities. The result of this is that while it is superior for form and beef, many of the cows are failures for dairy uses. On the contrary, the Holland cattle are regarded as the best known for yield of milk and cheese making. A dairyman who carries on a lage business near Utica, New York, imported some of the Holland cows about five years since. He soon found them preferable to every other variety he had tried. Two years ago he returned and made other purchases. He has just arrived here again, and is now busy in getting ready another importation. He is a very intelligent man, and gives as the result of his experience that the milk the Holland cows yield is greater in quantity, richer in quality and better adapted for butter and cheese making than that of any other species he has knowledge of. He told me that one of the young cows he took from here two years ago, frequently yielded as much as seventy-eight pounds of milk per day. Among those bought within the last week he has one that yields per day ninety-six pounds (two pounds being equal to one quart), so that she gives 48 quarts per day. It should be noted that some of the dairies in New York receive and pay for milk by the pound and not by the quart. He further said that his importation had turned out profitable; that such as he retained proved more than satisfactory for milk and butter; that when they were farrow and ceased giving milk they took on flesh rapidly and were soon ready for market; and that for those sold to other dairymen remunerative prices had been obtained. Another dairyman residing near Syracuse

came to Holland some eighteen months ago and took back with him a number of cows. He writes me that he is highly satisfied with them.

The genuine Holland cattle, as to color, are almost invariably white and black. Some few of them are of a mouse or Maltese color, but they are regarded as of a depreciated or half-breed stock. One family of them is so definitely marked that when seen at a distance one would suppose they were black, with a perfectly white cloth bound round their bodies. In travelling all through Holland, scarcely a specimen of any other color will be seen. It is conjectured that there is something in the climate in which they live, and in the food they consume that tends to this coloring.

The Holland cattle are thoroughly shorthorns, more so, indeed, than the Durham. Their shape is very symmetrical, with long, straight back, small head, with trim limbs. They are of large frame.

In disposition they are notably gentle and manageable. Their pastures not enclosed by fences, but by shallow ditches. Over these they rarely leap. Their knowledge of the boundaries in which they are to roam seem to be as well defined as that of their owners. An American cow would not be restrained by any such surroundings. She, with a progressive spirit, would cross the ditch, even if she mired in the attempt.

Treatment.

During the pasturing season they are at large upon the lot set apart for them. During much of the time they are clothed with a blanket of hempen cloth which defends them from the fogs of the night and the flies of midday. They are milked with prompt punctuality. When the milker summons them to the paddock, they obey his voice. When he takes his seat, with a cord always at hand, he ties their hind legs together, and with another attaches the tail, so that it cannot be whisked about. This prevents the knocking over of the pail and the soiling of the milk.

Over the large vessel into which the milk is poured, when the pail becomes full, a fine strainer is placed so as to catch all foreign particles. The most perfect care is taken of the lots in which they feed. Every few days a man will go over them with a shovel or rake in hand and scatter the droppings and supply the land with some fertilizing substance to keep the grass in healthy vigor. They practice here upon the theory that it is just as necessary to feed land as it is to feed animals.

Cow Houses.

During the winter these cows are confined in brick houses constructed for permanence so as to afford the greatest possible comfort and convenience under the same roof, and at one end of the building the dairyman or herdsman has the residence of his family. Between this residence and the stable is a large department used for the care of the milk and the cleansing of vessels, in which it is conveyed to market. It is supplied with a stove and a well of water. The stable is oblong with a hall through the center, from which all feed is supplied, the heads of the cows on either side being turned towards the center. The flooring is all of brick and the cows stand upon a brick platform five feet six inches in width. Immediately behind this is a gutter of the depth of eighteen inches which catches all excrements; still back of that is an aisle or walking place. The gutter is thoroughly cleansed every morning, and a stream of water made to pass through it. The manure is all taken to vats in the yard, and preserved for use during subsequent seasons.

Above the rear of the cows a pole or cord is extended through the entire length of the stable. To this the tail of each cow is attached in such way, that when she lies down it is always suspended sufficiently to prevent its contact with dirt. Sand being plenty, and cheaper than hay, is used for bedding. By this arrangement the cows are kept entirely clean, and the milk never takes the odor of the stable. The watering, feeding and milking of the cows is done with the regularity of clock work. The trough before them is filled three times during the day with clean water. They are fed frequently, and no more than they will eat in a short time. This mode is preferred, because it gives them intervals for rest, and their digestion is better if their stomachs are not over burdened. They are treated with kindness and tenderness. This induces contentment of disposition, and keeps them from becoming nervous and feverish. This greatly aids the secretion of milk. The Hollanders are impressed with the belief that if they keep their cows warm their product of milk will be much larger than if chilled by cold air. There are grated openings in the upper part of the walls for ventilation, but they are not large. The walls are thick and the loft above filled with hay. And so it happens, that if you enter one of these stables, coming from the clear air without, you are almost suffocated, with its extraordinary heat and closeness. This is the principal objection to their system. Nor do they yet seem to have found it out. Every now and then an alarm is raised throughout the country that some species of lung disease has shown itself among the cattle. The neighboring countries hear of it and inhibit by stringent laws their importation. The state inspectors are summoned, and wherever they find a herd with the symptoms of disease, they slaughter the whole of them, and the state pays their appraised value. This is a very expensive process. The moment I entered one of these large stables, and felt the temperature of the atmosphere breathed by these cattle, and perhaps breathed more than once, it seemed to me, that nothing short of a miracle would prevent lung disease. When spring comes the cattle are turned out as clean, as neat and with hair as smooth as when they went in from the green pastures.

It is a recommendation of this cattle that when become farrow, and cease giving milk, they take on flesh rapidly, and soon fatten. I am told that a few specimens of them are owned in Michigan by Mr. Sweet, near Grand Rapids, who obtained them from the New York importers. They excited much and general commendation at the last state fair.

As meat brings a higher price in Holland than any other article of food on account of an excise tax imposed upon its consumption, cattle are sold at about double the rates at which they may be bought in America.

DISCUSSION.

Judge Marston followed the reading of the letter with some earnest remarks in regard to the care of stock, calling attention to the great difference between the care taken by the Hollanders and that by the farmers of Bay county. He asked them to profit by the lesson taught by the narrative in the letter submitting that they would be greatly the gainers thereby.

Mr. Thompson, of Detroit, followed, and spoke of several specimens of Holstein cattle exhibited at the State fair held in Detroit last fall, from Tuscola county, belonging to Messrs. Johnson & Richardson. He considered the letter just read of great value, one of the most valuable articles on the subject ever read in any agricultural society in the State. He hoped that the matter

of improving the breed of milch cows in this country would receive a new impetus and this be the means of accomplishing much good in that direction.

Dr. Wight spoke in regard to his observation of dairies in Vermont, where one man made one hundred pounds of cheese a day, and a neighbor but forty pounds a day with a larger dairy, the difference being attributable to the different plans of the proprietors; one selected from his herd the best, the other took them as they ran, without regard to good, bad or indifferent.

Hon. W. L. Webber, of East Saginaw, said that a man who owned a herd of young cattle must experiment to find which were fit to keep and might find not more than thirty per cent worth preserving. This would be an expensive experiment; but if the herd were of good stock then he would probably find that full seventy per cent of the herd were worth keeping for dairy purposes. He advocated a systematic effort to improve the breed of milk cows in this section of the country.

George F. Lewis, editor of the Saginawian, then followed with

"A SCOLD AT THE RECREANT CITY CITIZEN."

MR. PRESIDENT, LADIES AND GENTLEMEN:—It is now near twenty years since I came to the Saginaw Valley, came from the old Macomb, a fine agricultural county; commenced at the outset to talk agriculture to the people of Saginaw; have talked it ever since; talked it till I am tired; and as women, who are better than men the world over, scold when they are tired, I propose to exercise a woman's privilege and scold.

What did you come here for? To have a visit and a good time with these admirable gentlemen, Judge Marston, George Lord, George Lewis, Fitzhugh, Gustin, Merrill, Miller and the others; to indulge in a little mutual admiration and get fat on the elaborate elegancies served up at the farm, or did you come for business? In a few years the entire industries of this section are to be changed. Very soon the bark of Mr. Saw Log and the growl of S. Saw Mill, Esq., will be numbered among the forgotten luxuries of Saginaw valley. Lumbering, which is the foundation of eighty per cent of the business of every city in the valley, will be finished within the life of a generation. A moment that is lost is lost forever, and that's what's the matter with a pine tree. He is the best man who best stimulates the next grand resource so that the one shall so help on and merge into the other, as to obviate the possibility of any hiatus in business. Some are now doing this; that's the chief trouble with Judge Marston. But why am I tired, and why scold?

At the outset, under the pressure of a full head of "youthful ardor," I said to the late Joe Hess of East Saginaw, one of East Saginaw's brightest and most practical of the early settlers of that mercurial city, "this must be a good country for farming." He replied "not a bit of it; it is too low, marshy, clayey, cold and wet." Dr. Hill, Saginaw's representative in the State legislature, paraded the same ideas before the citizens of all the State, and with only now and then an exception, the people of Saginaw valley said amen. There were less developments then than now, and no wheat maps. Little by little the agricultural interests grew; there were county fairs, afterwards State fairs, and finally, the grandest of them all, these farmers' institutes, and now the tide has turned.

Then why scold? I don't scold at everybody. Many have been liberal, aye, lavish in their efforts to aid the agricultural societies, but I scold at the people.

The recreant city citizen is the average citizen; the inspiration has not been broad enough to touch the popular heart, and local societies languish for the lack of the sympathy of those who in the aggregate will receive far the greatest benefit from the building up of this business. We say business, and mean business, for agriculture is soon to be *the* business of this valley, and let the developments of the next twenty years be but proportionate to those of the past five years, and it will prove a grander business than can the most sanguine to-day anticipate.

Oakland county has not one-quarter the need to develop farming that we have, and less than one-quarter the population that lies in the immediate vicinities of the Saginaws and Bay City, still the fair receipts were greater last year than the combined receipts of both our fairs, and this society made a profit of near one thousand dollars, while our whole receipts show about that much. There is no system to a scold, but I hope you see the point.

FORENOON SESSION.

Hon. Geo. Lewis, of Bay City, read a paper on the "Necessity of Developing our Agricultural Resources," of which we have not the manuscript.

Mr. Bradford, of Williams township, said I consider the pine lands mixed with hard wood among the best lands in our State. They have a rich clay subsoil mixed with lime and sand. Most of it requires underdraining and thorough farming, but when properly managed is more productive than most of the land in the southern part of the State. This I know from experience, as I have farmed on both.

Prof. R. C. Carpenter gave the following lecture on

"TRANSPORTATION OF AGRICULTURAL PRODUCTS."

Despite all that has been said to the contrary, the stubborn fact remains that producer and consumer are separated by a greater or less distance. Whatever is produced must be transported before it can be consumed, is a truth as universal in practical life as are the axioms in mathematics. The theory, that the workshop, the factory and the farm, could exist side by side and dispense with costly transportation, may at some future time be realized, but under the existing condition of things, such an arrangement is financially impossible—and in nearly every case it is tried, proves a practical failure.

Transportation is an effort, often a costly one, and as such, it is as much entitled to pay as any effort of the produce. Transportation in fact must be paid for either by consumer or producer. If the principles of free trade are untrammeled in their action, the cost of transportation is added to the cost of production, and the whole is paid by the consumer. Perhaps it is always true that the consumer pays the average cost of transportation when purchasing the articles produced, but the average cost of transportation is in nearly every case less or greater than the cost of transportation from any given place. The result is invariably found to be that so far as the producers of agricultural products are concerned, the price realized is greater as the cost of transportation is less. A sweeping and universal reduction of the cost of transportation would probably be followed by a corresponding reduction in

price, and the consumers, not the producers, would be the gainers thereby, but at the same time the prices received by the different producers would vary; those receiving the most who could transport their products the cheapest.

The actual benefit of any system of transportation is more of a comparative than absolute character. It is rarely that it can be reckoned in dollars and cents; but if transportation facilities for one place are equal in every respect to those of another, the benefits for those two places are equal. Thus, if the shipper from Chicago can send to New York as cheaply and conveniently as the shipper within one hundred miles of New York, their benefits are equal, so far as the growing of produce, which is marketed in New York is concerned, and the value of land thus employed should vary directly with its productiveness.

Means of Transportation.

Until within a few years the main avenues of transportation were confined to the water, but since the introduction of the railroads, they have assumed more and more importance until to-day the railroad is emphatically the main avenue of transportation. Of the internal commerce of the country about 86 per cent is conducted over railroads, the remaining 14 per cent is distributed in varying amounts among our lakes, rivers, and canals.

Water Communication.

Canals and channels for artificial water communication generally are too costly for an extensive adoption, and farther, from the experience of the Erie canal and the New York Central Railroad, it is safe to say that when both canal and railroad system are worked to full capacity, the canal can not compete with the railroad either in rates or facilities to shippers.

Natural water communication can be taken direct advantage of only by towns in favored localities, but indirectly lines of transportation over our natural waters affect all transportation, by modifying the cost (or at least rates), from towns possessing water routes.

The laws which govern shipments over our natural waters must be the same as those which govern any business, for true competition can have unlimited action, and in course of time, the average of the rates charged must be such as to give a fair living profit, and no more, for excessive rates would induce a competition that would soon lower them, and very low rates would drive away competition, and so tend to raise them.

Overland Transportation—Common Roads.

As lines of water communications can be established and made to pay only in favored localities, we shall give them no further consideration, but turn our attention to the existing means of transportation, overland. The land transportation is conducted over either the common road or the railroad. The railroads serving as the main channels, which carry the articles when once received, to the distant markets, while the common roads act as feeders, and are used mainly in transporting articles a short distance.

The common roads have never been used in competition with the railroads since the railroad system has been fairly established. The capabilities of railroads are so much greater than those of common roads that since Stephenson perfected the railroad system, and showed practically what might be expected from it, little attention has been paid to the improvement of the common roads. While it is certainly true that it will not pay to invest a great sum in

the improvement of common roads, it is equally certain that it will pay to improve them to a much greater extent than has been done in the past.

The following table shows the average draught over different kinds of roads, from experiments by Sir John Macneill; also the load for a team over each road, deduced on the supposition that an average horse "can exert a steady pull of 100 hundred pounds, at a speed of 2½ miles an hour for ten hours each day."[1] In the table the net load is assumed as two thirds the gross load, but in practice it will be found less more often than greater. The cost is also given on the assumption that wages of man with team and wagon is $2.50 per day; which furnishes a means of comparison of the different roads, but except in a few cases it will not give the exact cost of transportation.

KIND OF ROAD.	Level Road—Proportion that resistance bears to whole load.	Load for two Horses.			Cost per Mile, Assuming Cost of Wagon, Team, and Driver $2.50 per Day,—Distance 25 Miles.		Maximum Distance Wheat worth $1 per Bushel can be drawn.—Miles.
		Gross Load in Tons.	Net Load. (Two-thirds of Gross Load.)				
			Tons.	Bushels.	Each Ton.	Each Bushel.	
Smooth stone pavement	1-68	6.8	4.52	151	.024	.0007	1,430
Broken stone road on rock foundation	1-49	4.9	3.27	109	.031	.0009	1,111
Broken stone road on earth foundation	1-34	3.4	2.28	76	.044	.0013	770
Gravel road	1-15	1.5	1.00	33	.100	.0030	333
Good earth road	1-11	1.1	0.73	25	.137	.0041	244
Common sandy road	1-7	0.7	0.47	16	.213	.0064	172

The cost of these roads can not even be approximately given as cost of grading, turnpiking, and putting on the road covering differ so much in various localities. The cost of maintaining is somewhat in proportion to the traffic or tonnage.

The least cost of a gravel road containing 3520 cubic yards of gravel per mile, under the most favorable conditions will probably be not less than $800 per mile, $400 of which should be expended in each of the first two years. Under some conditions the cost will amount to four to six times this amount. If the road is well made the cost of annual repairs will be small; say for the next eight years $50 per mile, that is, a man and team at work constantly would keep in repair fifteen miles. This would give us an average annual cost during the first ten years for a good gravel road of $120 to $520 for each mile. For a second term of ten years its cost per mile would be less. A broken stone road would give an average cost of probably twice this amount for the first ten years, whereas, for the second term of ten years its cost would probably be less than that of a gravel road. These figures would indicate a greater economy in a gravel road than is usually supposed. To illustrate this we will take an example which is certainly not unreasonable. Suppose that after a road is

[1] This has been found by numerous experiments to be an average day's work for a horse. See Trautwine's Civil Engineering, page 603.

improved 20 loaded teams per day pass over the road, carrying per team a load of 33 bushels of wheat or its equivalent, at a speed of $2\frac{1}{2}$ miles per hour. The traffic over the road would amount to 660 bushels per day, and its cost of transportation would amount to $1.98 per mile (see table) per day. To have carried the same amount over our ordinary country roads would have cost $4.22 per mile per day. So that the improved road gives a saving of $2.24 per mile for each day. If we suppose that this traffic is maintained for 300 days in the year, the saving will be $672 per year per mile, and this will probably not be too high an estimate, for when the common roads are much affected by bad weather in Spring and Fall, the traffic over the improved road will probably be increased to an extent sufficient to make up deficiencies in the traffic that may occur in the winter-season, at which time the cost of transportation is about the same over common and improved roads. If the average cost of gravel roads be taken as $250 to $400 per year for each mile, the saving with the small traffic specified, viz.: Two teams each hour, is enough to pay the cost and a good interest (50 to 160%) on the investment. Such considerations as these tend to show that time spent in improving the roads, is not entirely thrown away. These figures would also seem to indicate, that we are paying in extra cost of transportation over poor roads, a tax which would do much toward building good ones. A poor road is a toll collector that needs no gates to exact its dues. All who pass over it must pay in diminished loads and extra time a tax proportional to its wretchedness. If the general public could be made to feel that waste of time and waste of money are equivalents, and that extra time spent in traveling over the roads could profitably be employed at home, some steps would be taken that would lead to an actual improvement in the condition of our common roads.

The Railroads.

Most great inventions gradually creep into the world, and are received without excitement and almost unconsciously appropriated. It was not so with the locomotive and its sequence, the railroad, though both the locomotive and the railroad were gradually brought to a state of perfection, the world was in almost entire ignorance of their very existence until they were perfected and their power vindicated at the Rainhill trial, October, 1829. "This improvement burst upon and surprised the world rather than crept into it."

It was a surprise in the beginning, and though it was at once adopted by the whole civilized world, its nature was not understood, and its history during the 50 years of its existence has been that of one continual series of surprises. The builders of the first railroads were surprised at the enormous traffic they could accommodate, and at the enormous traffic they received. They were surprised at the dividends on their investments. They were surprised in latter times when they had come to expect dividends, because they did not pay, as they formerly had been surprised because they did pay. In England they passed laws regarding them, and then were surprised to find that the laws did not affect or improve the railroads. The law-making power said the railroads should not consolidate, but in spite of that it was but a short time before the roads were, with few exceptions, under one management. It was supposed that low rates were maintained only by competition, yet the people were surprised to find that consolidation lowered rather than raised rates. From beginning to end the railroads have proved a surprise, and in view of past experience, there is no man who has studied the question, who dares to predict what

will be the next surprise in their development, or in fact what will be their future if left unmolested by the law. The fact is that until within a few years the project of railroad economy attracted no attention whatever. Railroads were built, dividends were paid on the stock, which were received by the stockholders and no questions asked. If railroads were studied, it was purely from a constructive stand-point. The question that was raised was, how to build them, and not how to make them pay. With the public in general, railroads were regarded as a great necessity, and the question with them was, "How can we get a railroad and how much can we afford to pay for one?" The builders of the railroad mainly looked to the probabilities of getting their pay. If they were paid, the railroad was a small matter. These considerations were the principle ones raised during what will ever be known as the construction period of railroads in this country. This period began in 1830 and practically ended in 1873 (though present appearances seem to indicate that a new era of construction is about to commence). During this whole time (1830–73), the question regarding the future payment of the obligations incurred seems hardly to have been raised. The public had implicit trust in railroads, and bought at some price all the stocks and bonds thrown into the market. So long as stocks and bonds sold, railroad building continued. The panic of 1873 affected railroads the same as any enterprise: their stocks and bonds could not be sold. They could not pay their usual dividends or even the interest on their bonds. The affairs of railroad companies were investigated, and dishonesty and irregularity to a surprising extent were discovered. On many of the roads that had paid the highest dividends it was found that their income did not actually pay their operating expenses. Their dividends were paid by throwing into the market additional stock or bonds and consequently were not in any sense legitimate. Many of the roads were declared bankrupt and either placed into the hands of a receiver or sold in order to meet the obligation incurred by their bonds. The bankrupt roads were still run, and soon the phenomena was presented of active competition between bankrupt and solvent lines. The bankrupt lines, with reputation gone, with no desire even to earn money, offered rates often below the actual cost of transportation. In order to secure for themselves business, the solvent lines were obliged to carry at the same rates. The cutting of rates once begun might have been continued indefinitely but for the desire of the solvent roads to keep out of bankruptcy. This excessive competition led to a combination of the different roads. This combination has been repeatedly broken, and as often re-formed on a stronger basis.

As an illustration of these general statements, it will be interesting to note the growth of competition for the transportation of produce from the west to the east. As it will be impossible to consider the relations between all the various roads from the west to the seaboard, we will notice simply the competing lines from the city of Chicago to the sea. This system of competing lines is perhaps the most important of any on the continent, but it must not be supposed that there are no other similar systems. Nearly every city of importance has two or more roads by means of which produce may be sent to the more important cities.

The trunk lines composing the Chicago system, with one or two exceptions, do not represent a series of simple railroad lines built, owned and run the entire distance from Chicago to the sea by one company, but on the other hand, each trunk line in this system with one exception is composed of several

shorter lines, united by contract or by common management or ownership, into one continuous line. The trunk lines belonging to this system are:

First, The line formed by the Chicago and Lake Huron, Chicago and North Eastern, and the Grand Trunk, making a total distance from Chicago, to Montreal of 827 miles, or to Portland 1,125 miles.

Second, The Grand Trunk and Michigan Central. By this route Montreal is 846 and Portland 1,146 miles from Chicago.

Third, The Michigan Central, Great Western, and New York Central, or Erie. By the New York Central the distance from Chicago to New York is 962 miles; by the Erie it is 956 miles.

Fourth, By the Michigan Central, Canada Southern, and New York Central, or Erie, New York is 976 to 962 miles.

Fifth, Lake Shore & Michigan Southern and New York Central, New York to Chicago, 979 miles.

Sixth, Baltimore & Ohio, Chicago to Baltimore, 852 miles.

Seventh, Pittsburg, Ft. Wayne & Pennsylvania, Chicago to Philadelphia, 914 miles.

Thus we see seven independent, or once independent competing lines, consisting in every portion of at least five lines of railroad. Some of these lines, as the M. S. & L. S., are double tracked roads, and consequently the capacity of all roads leading from Chicago to the sea is fully equal to that of seven single tracked railroads. The whole amount of freight transported from the territory lying west of the meridian of Buffalo does not exceed 8,000,000 tons according to U. S. Government Report on Internal commerce.

The capacity of a single track freight railroad, when well equipped, is calculated to be 9,000,000 tons per year—that is a single well conducted railroad could carry not only what is carried by the seven lines mentioned, but also what is carried over all the other roads of this great region, and over its navigable streams and lakes. Practically the capacity of a single freight road can not be so great, for want of terminal facilities, side tracks, etc.

The New York Central, with its miles of four parallel tracks, carries over its lines each way but one and one-half miles of freight cars daily. The capacity of the road would permit many times this amount. This fact clearly indicates that the carrying capacity of our roads has increased much faster than the business that must pass over them.

As a matter of fact, roads have been built, in nearly every case, not as legitimate business enterprises, but to advance the interests of private individuals, of portions of the country, or of cities. Thus in this State the Michigan Central was partially built by the State, not with the expectation of making money from the railroad, but for the purpose of developing the interests of the southern portion of this State. It is the same with the land grant roads so far as government is concerned. It does not care whether the roads pay, that is not the question; what it desires is, to advance the interests of the country. It has been the same way with cities and towns, realizing the necessity of transportation by railroads, they are induced to subscribe or to make large grants to secure a railroad; and to secure the advantages which is generally believed to exist in unlimited competition they are willing to make still further grants. These practices have been carried to such an extent that it is probably true that not a single road has been built free from the influences of local subscription, and on a route which in every essential is most favorable to business. The bane of local subscription is not so much that it aids in the con-

struction of needed roads, but it constitutes such a stimulus for railroad building that it is likely to lead to the construction of four or five roads, when there is not business sufficient for one. The trouble is that railroads have not been built as an end, but as a means of enriching some region or township. Even cities themselves have entered into the arena as railroad builders,—thus, Cincinnati, failing to get what her business men considered low transportation rates from the south on any of the three lines already existing, has issued bonds and has now almost finished a road to the south 336 miles in length. This road has been built not with the expectation that it will earn dividends, but simply to benefit Cincinnati.

The opinion universally held in the past and now believed by most of the business men, is that the more numerous the roads, the greater the competition, and the less the rates. It is hard to see the logic by means of which such conclusions were deduced. It is true that the past has to a certain extent confirmed this theory, but that might have been expected from the way in which the capital of roads was raised. Thus take the five competing lines which have been built one after another under this same stimulus into Chicago. When first built, competition for business to fill their empty cars was sharp, and it grew sharper. Rates were lowered regardless of cost, cattle being taken to New York (it is stated) as low as $1 per car. As long as the railroad companies could borrow or were donated money, this was continued. It is a fact that business on a losing scale cannot long be continued, and the result was what any thinking man must have foreseen: First one of the trunk lines became bankrupt. The bondholders placed the road in the charge of the United States court. It was still run but with less regard than before for paying rates. The U. S. courts, we may remark here, have not as yet in a single case been successful railroad managers, although in connection with receivers they have run and are running miles upon miles of road. Take the case of the C. & L. H. R., a road that sends its trains very close to us, and we find that in 1877, although that road carried an immense amount of freight, still it did not earn enough to pay running expenses. This constant drain incurred by the loss in the freight traffic may be carried on one or two years or even longer; it can be carried on until the road can run in debt no longer, then the road must be sold to pay its debts, and when it is sold it brings an amount many times less than its first cost or even its value. This was the case with the D., L. & N. The C. &. L. H. has as yet not been sold, but its credit is well nigh exhausted, and it soon must be sold. The effect of every such sale is to consolidate and unite the management of different railroads—for a competing line can afford and will give more for a bankrupt road, than any other line. They can afford to pay a good deal in order to stop competition. As an exercise in pure reasoning we can see that if seven roads are built and compete for the business which one road could do, these roads, if run at all, must at least receive sufficient pay to cover repairs and running expenses; for seven roads these are at least four times as much as for a single road, and this extra cost must be met by increased freight charges. This much is always true: that the effect of the construction of a greater number of roads than are necessary to accommodate the traffic is to increase to a great extent the cost of transportation. The price may for a time-being be lowered, but in time the result will reach its normal position, and the owners of railroads will by combination or by uniting into one management receive such rates as to make their investment pay.

The railroad owners have, during the last four years to a great extent, combined and united into single managements, and if another mania of railroad

speculation does not burst upon the country, we may expect soon to see constant and uniform rates.

There has been great difficulty in securing a combination of railroads, and in some instances it has appeared that the only way to secure such a result was to place a single man in management of all the lines. This belief of the capitalists has placed Vanderbilt in control of two of the trunk lines, and given him such a position as to stop competition over two more lines.

The difficulties in the way of a combination are many, and as yet no combination on east bound freight has been devised that has proved permanent. One element which has done much to prevent the adoption of a permanent rate by railroads is the competition of water routes. To meet that, it has been the custom for some years to maintain lower freight rates during seasons when the lake could be navigated, than during the winter. Another element which has affected, and must always affect freight rates is, the commercial interests of the terminal cities. Thus in the system under consideration, the Grand Trunk leads to Montreal (although it has branches to Boston and Portland), the New York Central to New York mainly, but also to Boston. The Pennsylvania road to Philadelphia, although it has a branch to New York. The Baltimore & Ohio to Baltimore, although this also has branches or connections to New York and Philadelphia. The eastern termini mentioned are all seaport towns, and all directly interested in building up foreign trade. The fiercest railroad war ever known was waged during the year 1876, entirely to settle the question of rates from Chicago to the various ports mentioned. In 1873, as before mentioned, was the first railroad combination including the managers of trunk lines. This combination did not include either the Baltimore and Ohio or the Grand Trunk, consequently it was of short duration, as no combination could exist unless all the roads would enter. A short but bitter war with the Baltimore and Ohio soon brought them to terms and forced them into the combination. Thus the combination was made to include all the roads but the Grand Trunk.

In this case the Grand Trunk alone prevented the combination from efficient working for more than two years. Now the Grand Trunk has no Chicago line, neither has it a line to New York; but being a bankrupt road, and in connection with the Detroit and Milwaukee also a bankrupt road, it presented a line from Milwaukee to Boston. Consequently during this time the rates from Milwaukee to Boston were much less than from Chicago to Boston, and the rates from Boston to Milwaukee were less than half the rates from New York to Chicago. The result was disastrous to all business in both New York and Chicago, while the prosperity in Milwaukee and Boston were unexampled. The grain that formerly had gone over the Chicago routes now passed through Milwaukee.

The New York Central hesitated about declaring war against a bankrupt road,—it was like undertaking to collect damages of a beggar,—but finally the solicitations of the Chicago and New York merchants lead them to declare war. In this case the declaration of war produced peace. The Grand Trunk entered the combination Nov. 1875. This combination, although managed by the New York Central, proved more disastrous to its interests and to the interests of New York than did the competition of the Grand Trunk.

Before this combination Nov., 1875, because of shorter distance, the Baltimore and Philadelphia roads were allowed to carry from Chicago, for five cents per hundred less rate than the New York Central. These were changed so that the Baltimore and Philadelphia roads were allowed to charge $12\frac{1}{2}$ per cent less. The result was more disastrous to New York than had been any previous arrange-

ment. This rebate was found sufficient to ship grain to Liverpool by the way of Baltimore or Philadelphia as cheaply as it could be taken from Chicago to New York. The result tended to make the ports of Philadelphia and Baltimore more important than that of New York. The New York Central soon discovered its error, and with its characteristic consistency withdrew from the combination and commenced a railroad war. This war was the fiercest ever waged, involving as it did the three strongest lines in the country, and the three strongest cities. The New York Central conquered, at an immense expense,—and it established the principle now reckoned as an axiom, "that the shortest lines shall fix the rate and the long lines can carry for that rate if they wish." So that freight can be shipped from Chicago to New York, Chicago to Boston, or Chicago to Baltimore for the same rates, with certain rebates for ocean freights; so that the price from Chicago to Liverpool shall be the same by any of the routes. (This arrangement on east bound freights has not been rigidly adhered to in the past for any considerable length of time.)

A combination has existed for some time on west bound freights, and the basis by which the roads have worked harmoniously together on, is found not on a scale of prices but on a scale of quantity. That is, each road charges the same rate, and is entitled to a certain percentage of all west bound freight, and is paid for carrying that amount whether it carries more or less. The affairs of the different railroads being adjusted by a sort of clearing house of which Albert Fink is the manager.

A pool on east bound freights has been recently formed on the same basis.

Though the present combination contains many elements of discord, and is liable to be broken at any time, it still is sufficient to indicate that the period of competition will be followed by one of combination, in this country as in England. The period of competition may be said to overlap the period of construction, beginning perhaps before 1870, reaching its height in 1876, and still existing with smouldering embers, which the least breeze may fan into an active flame. The period of combination began in 1873 on a small scale at first, and was soon broken. But every year has seen it increase in strength, until to-day it seems certain that the time will soon come when combination will became a fixed fact and competition a thing of the past.

These three periods, construction, competition, combination, are common in the development of the railway system in every country where it has been allowed unrestricted growth. It is especially true in England where the constructive period may be said to have ceased some years before ours. There, as here, combination was looked on as almost ruinous to the business interests of the country, and laws as stringent as could be devised were proposed to prevent it. A railroad monopoly was regarded as a national evil, and the cry became that if the law did not manage the railroads, the railroads would manage the law. A committee was appointed to consider the proposed condition of the railroads, but before they could report, the dreaded consolidation had taken place, England was divided into districts and competition had practically ceased to exist. The only thing left for the English parliament was to watch the railroads and prevent by wholesome legislation any extortion that might arise. "The conclusion arrived at by the committee on railroad combinations, was that although English legislation had cost the companies over $3,200,000,000 it had never accomplished anything which it sought to bring about, nor prevented anything which it sought to hinder." They also concluded that competition between railroads cannot be maintained by legislation. They believed it was at present not policy for the government

to own the railroads, though they suggested some legislation that might tend to bring this about. As for the effects of consolidation the Northeastern railway was referred to, which consists of thirty-seven once independent and competing lines, and is the most complete monopoly in England. Yet it paid the highest dividend, and charged the lowest rates of all the great English companies, and whereas complaints were frequently made against the other companies, none whatever had ever been made against this company.

On the whole, combination seemed to be giving satisfaction in England. The governments of continental Europe have themselves been railroad builders, and restrictions were put upon other lines, so as to make competition possible only within certain limits. In those countries the governments own most of the lines and expect in time to control them all. Their lines appear to be well run, have low uniform rates, and in their management have given a satisfaction to the public which has not been equaled on the American lines. So much in regard to the general development of the railway lines in this and in other countries. Now we will briefly refer to some phases which have characterized this development in this country. The first thing to attract notice is the remarkable growth of the railroad system in this country. Though an English invention, it was received here with a favor unknown at home, and its development in this country has been so characteristically American, that although it is of English origin our railroad system is in every other respect decidedly American.

In 1827 there were in the United States three miles of (horse) railroad; in 1830, 41; in 1835, 918; in 1840, 2,797; in 1845, 4,522; in 1850, 7,475; in 1855, 17,393; in 1860, 28,771; in 1865, 34,442; in 1870, 48,860; and in 1873, 70,651: in 1878, 81,800, and nearly seven hundred different railroad companies.

The following table shows the miles of railroad in the principal countries of the world:

NAMES.	Date.	Miles Completed.	One mile to Square Miles of Area.	Inhabitants to one mile of Railroad.
Belgium	1874	2,093	6	2,390
United Kingdom, G. B. and I.	1873	16,082	7	1,860
Germany	1874	15,080	14	2,550
Switzerland	1874	977	16	2,570
France	1874	12,409	16	3,080
Italy	1874	4,274	27	5,990
Austria	1874	9,525	20	3,770
Denmark	1874	557	27	2,700
Spain	1873	3,310	59	4,925
United States	1873	70,651	51	566
Australia	1873	1,419	2,083	1,354
Mexico	1874	306	2,451	29,947
Canada	1874	5,030	662	561
India	1873	5,204	183	36,270
Russia	1874	10,560	757	6,480
Brazil	1873	710	5,367	14,219
Netherlands	1874	955	14	4,052

World, 1873-4, about 195, 129 miles completed.
The entire earth, after deducting Africa, one mile of railroad to 190 square miles of area. Population to one mile of railroad, 3,833.

From this table it is seen that the United States possesses more than four times the number of miles of railroad of any country in the world, and

more than 33⅓ per cent of all the railroads of the world. In respect to population, it possesses more miles of railroad than any European country. In respect to area it possesses one mile of railroad to each 51 square miles, and compares favorably with most of the countries of continental Europe.

The total stock of the railroads of the United States in 1873 was $1,947,638,-584 total. The total capital (stock and bonds) was $3,784,543,034, or about 1.8 times our national debt. According to the government report on the internal commerce for the year 1876 the government has furnished $14,000,000 in contributions to the various roads, and the total cost of the entire railroad system is 4½ billions of dollars, or more than twice our national debt.

The following table from the report of the railroad commissioner shows the growth of the railroad system in this State:

Year.	Miles Completed.	Year.	Miles Completed.
1838	63	1858	703
1839	71	1859	770
1840	104	1860	770
1841	147	1861	777
1842	147	1862	811
1843	180	1863	812
1844	220	1864	891
1845	233	1865	931
1846	279	1866	943
1847	279	1867	1,066
1848	326	1868	1,124
1849	353	1869	1,362
1850	380	1870	1,739
1851	421	1871	2,298
1852	425	1872	2,822
1853	425	1873	3,252
1854	425	1874	3,313
1855	462	1875	3,347
1856	530	1876	3,410
1857	579	1877	3,455

Michigan, at the close of 1877, averaged one mile of railroad for 16 square miles in area, and for 376 inhabitants. So that, compared with the whole United States, she has in proportion to area more than three times as many miles of railroads, and in proportion to inhabitants about one and one-half times as many miles of railroad. Michigan is, on the whole, well provided with railroad facilities, though their distribution is hardly as uniform either in proportion to area, population or production as might be desired.

Although Michigan is well off so far as railroads is concerned, the same cannot be said of the railroads; indeed it is hardly possible to conceive of a worse financial condition than that they represent. Most of the roads were built when prices were high, they were built largely by the sale of bonds which were sold much below par. The original stock was sold often at a price many times below its par value, and add to all these a circumstance that often existed, viz.: dishonesty of railroad officials, and it is little wonder that our railroads find themselves burdened with a debt nearly equal to and sometimes exceeding their actual cost.

The total debt and stock of our railroads footed up at the end of 1876 to $306,579,352.20, and at the close of 1877 to $312,799,083.41. This shows an increase of $6,219,731.21 although one road by being sold under the hammer had its debt decreased by re-organizing and wiping out the local stock $1,715,-430.58. Had the debt and stock of that road remained the same the increase would have been $7,935,161.79. The increase in the length of the roads

during the same time was 44.53 miles, of which the total cost probably did not exceed $100,000, or about $23,000 per mile. This would show, deducting cost of new roads a stock and debt account increasing by more than 7⅔ millions each year above the cost of construction. You can readily see where this must lead to—bankruptcy, sale and reduction of debt to the true value is inevitable.

The total debt, over and above the par value of stock, carried by our roads at the close of 1876 was $164,546,118.76, and at the close of 1877, $167,271,-421.65, thus showing an increase of obligations on which interest must be paid of $2,725,302.89, whereas, the actual construction of new roads would not warrant the increase of this debt by more than $100,000. The stock and debt together represent an amount $21,817,654.86 in excess of the estimated cost of our roads, and yet the estimated cost is in most instances much above the real value, so that it is certain that our roads are struggling under obligations more than twenty-two millions of dollars in excess of their value.

In regard to the capital stock our railroad commissioner states, "that in many of our companies it represents no value in the road: it is a fiction; the bonded debt as a rule, is greater than the actual cost of construction and equipment; there may be a few exceptions to this rule, but they are very few." "Under such circumstances it is not surprising that the unfunded debt should be constantly increasing, and that bankruptcy is so generally inevitable."

The following table, compiled from the Report of the R. R. Commissioner for 1877, gives the condition of 34 out of 39 of the lines of railroad in the State:

TABLE.

ROAD.	Length. Miles.	Cost Per Mile.	Debt Per Mile.	Stock and Debt Per Mile.	1877. Operating Expense Per Mile.	1877. Earnings Per Mile.	1877. Int. and Operating Expenses Per Mile.
Chicago & Canada Southern	67.6	$70,927 53	$50,286 65	$89,745 23	$1,203 17	$878 25	$3,858 20
Chicago & Lake Huron	232	54,936 34	44,682 20	69,515 82	3,411 48	2,076 00	5,264 08
Chicago & Michigan Lake Shore	246	28,902 64	35,303 69	41,460 87	1,658 03	1,986 92	5,519 28
Chicago & North Eastern †	50	*45,000 00	25,000 00	45,000 00	....	....	....
Chicago, Detroit & C.—G.T.R.R.	59.37	59,511 32	18,443 66	34,933 50	6,585 28	7,142 96	8,375 88
Detroit & Bay City	118.5	*31,144 80	24,618 96	35,802 01	2,229 86	3,050 45	3,802 20
Detroit & Milwaukee	189	65,046 63	50,438 61	63,756 81	4,184 22	4,894 82	6,206 70
Detroit, Hillsdale & S. W.	64.8	20,575 63	425 05	20,170 42	840 13	838 39	871 57
Detroit, Lansing & N.	181.5	39,267 20	16,413 93	40,265 26	2,785 75	4,344 69	4,080 25
Kalamazoo, Allegan & G. R.‡	58	25,000 00	14,482 78	24,999 85	1,556 23	2,161 87	3,335 54
Flint & Pere Marquette	279.8	31,118 43	31,495 28	43,281 30	2,147 05	3,468 75	4,350 19
Ft. Wayne, Jackson & Saginaw.	100	31,238 22	24,710 00	32,209 50	1,792 85	2,543 34	3,392 85
Grand River Valley ††	82.4	34,466 40	18,203 88	23,165 04	2,423 12	2,711 93	4,503 90
Grand Rapids & I.	332.1	33,397 11	29,590 58	38,021 74	2,254 10	3,304 54	4,182 40
Hecla & Torch Lake	4.5	43,265 23	18,265 23	43,265 23	10,965 26	9,428 83	10,965 26
Lake Shore & Mich. Southern	1,176.8	87,908 05	41,348 60	99,182 81	7,617 23	11,476 17	10,120 13
Mansfield, Coldwater & L. M.	19.5	5,399 04	....	....	515 56	514 88	1,122 50
Michigan Central	270	106,854 26	92,258 00	113,658 75	11,627 15	18,746 95	18,267 04
Jackson, Lansing & Saginaw ††	233.6	29,622 37	17,268 83	25,725 97	1,859 16	3,044 41	3,579 58
Michigan Lake Shore	57.5	25,962 59	24,618 00	32,444 08	725 23	973 38	2,165 42
Michigan Midland & C.	15	39,175 94	27,660 33	47,660 33	392 86	344 82	1,902 19
Mineral Range	12.5	31,323 48	22,655 81	33,005 81	4,751 65	7,477 34	6,536 45
Toledo, C. S. & Detroit	54.5	54,444 03	41,799 45	70,396 92	6,788 34	5,023 47	3,699 60
Toledo & South Haven	9	6,157 46	874 00	3,111 33	117 20	614 48	117 04
Northern Central Michigan †	61.14	*22,185 15	25,000 00	34,977 12	1,067 24	1,295 30	....
Chicago, Saginaw & Canada	20	12,052 63	16,973 68	24,500 00	766 24	869 60	1,413 75
Glencoe, Penconning & L. S.	13	7,017 37	6,153 84	7,017 40	930 60	886 86	1,545 91
Grand Rapids, Newaygo & L. S.	46	32,856 00	22,757 00	34,344 00	995 22	2,396 35	2,301 31
Detroit, Monroe & Tolede ‡	64 95	20,799 48	14,833 84	21,481 77	3,273 12	5,102 41	4,274 83
Marquette, Houghton & O.	88.52	93,606 93	73,984 77	139,152 12	3,724 23	7,633 66	8,829 25
Mich. Air Line R'y.	20.80	15,052 00	99 57	14,570 72	1,311 12	1,452 89	1,311 12
Mich. Air Line R. R. ††	114.72	27,592 66	21,393 64	24,449 87	3,162 26	932 37	4,626 69
Saginaw V. & St. Louis	28.70	28,457 89	15,570 66	24,800 76	....	....	1,599 01

* Not equipped.
† Operated by C. & L. H.
‡ Operated by M. S. L. S.
†† Operated by M. C.

From this table it is seen that the cost per mile varies from $106,854.26 on the Michigan Central to $5,399.04 on the Mansfield and Coldwater,—which however is as yet unfinished. The cost per mile on the Toledo and South Haven, a narrow guage road, was $6,157.46. Of the ordinary guage roads in fair condition the Glencoe, Pinconning and L. S. has the lowest cost, $7,017.37.

It is further to be observed that the following roads are carrying a debt in excess of their estimated cost:

	Debt per Mile in Excess of Cost.
Chicago and Michigan Lake Shore	$6,401 05
Chicago, Saginaw and Canada	4,921 05
Flint and Pere Marquette	376 85
Northern Central Michigan	2,814 85

It is also seen that the following roads have a cost in excess of both stock and debt: Chicago, Detroit and Canada,—G. T. R. R., Detroit and Milwaukee, Detroit, Hillsdale and S. W., Jackson, Lansing and Saginaw, Toledo and South Haven, Grand River Valley, Michigan Air Line R'y, Saginaw Valley and St. Louis, Michigan Air Line R. R.—Kalamazoo, A. and G. R.

The cost of the Chicago and Northeastern (as yet not owning its equipment), and of the Hecla and Torch Lake road, is equal to the stock and debt. Each of the other roads shown has a valuation less than the sum of stock and debt.

Of the thirty-nine roads in the State nine of them did not pay during 1877 the expenses of running the trains and keeping the track in order. Those roads were as follows, and the operating expenses above earnings were:

Chicago and Canada Southern	$21,964 63
Chicago and Lake Huron	268,097 01
Detroit, Hillsdale and Lake Shore	112 45
Glencoe, Pinconning and Lake Shore	581 54
Hecla and Torch Lake	6,145 70
Mansfield, Coldwater and L. M.	7 91
Michigan Air Line	255,812 76
Michigan Midland and C.	820 68
Toledo, C. S. and Detroit	96,184 98
Total	$589,727 66

Eight more paid no portion of their interest, though able to pay operating expenses, while of the whole thirty-nine but twelve actually paid all liabilities.

The following constitute the twelve roads that had receipts in excess of operating expenses, interest and rental:

ROADS.	REMARKS.
Chicago and Northwestern	Out of 1,615.7 miles operated has 197 in Michigan.
Detroit, Lansing and Northern	Reduced debt by sale, as previously noticed.
Lake George and Muskegon River	Road built for purpose of transporting logs and lumber.
Lake Shore and Michigan Southern.	
Detroit, Monroe and Toledo	Operated by Michigan Southern.
Northern Central Mich.	Operated by Michigan Southern.
Michigan Air Line R'y	Short local road from Romeo to Ridgway.
Michigan Central.	
Mineral Range	Narrow guage.
Paw Paw	Narrow guage,—operated by Toledo and South Haven.
Saginaw Valley and St. Louis.	
Toledo and South Haven	Narrow guage.

The fact seems to be clear that if railroads are a grinding monopoly they are grinding themselves worse than the public. But it may be they are grinding themselves at the expense of the public. When a bank fails it is not the bank nor the bank officials that suffer but the depositors, and it may be so with the railroads. Though they are clearly committing financial suicide, and the public along their lines apparently gaining all they lose, yet the fact may be that one portion of the public is simply living on another. Railroad bonds are quite as likely to represent the saving of poor people as any investment, and when their value is ruined suffering is as likely to follow as from the breaking of a bank.

It is little to be wondered at that our roads cannot meet all their obligations, but when nearly one half of the roads cannot pay anything more than operating expenses it would seem that there must be some defect in the method of conducting them. This state of affairs may be brought about by two things,—lack of business or by too low a rate. There are a few roads in our State that are built in positions where no road could pay; these roads are usually uncompleted parts of through lines, and consequently are receiving a very small amount of business. The true cause of this condition is doubtless to be found in the low rates at which through freight or freight from competing points is carried. This is a result of the railroad war which has been referred to,—and it is a fact much deplored by the railroad managers, that the through freight rates are fixed utterly regardless of cost. The railroad wars are wars for business, and no effort, honest or dishonest, that will bring business to the line is spared. It soon leads to discriminations between individuals. The published schedule of rates is adhered to only in rare cases, many of the shippers practically make their own rates. The result is that different shippers pay different prices for the same class of feights, and legitimate business interests are demoralized and converted into an uncertain speculation. For the non-competing places no mercy is shown. The rates are made just as high as is possible without driving the traffic away from the railroads. If business from non-competing points is sufficient, it prevents the railroads from losing even though they carry through freights for nothing. These facts are well known; no town has felt itself safe from railroad discrimination or extortion unless it possessed at least two independent and competing lines. It has been the case in the past,

and probably is true yet to a certain extent, that towns with but one line of railroad, could not compete with towns in their vicinity possessing two lines. The result has been that towns without competing lines of railroad, could not live unless they were so far from competing towns as not to feel their influence. The freight charges on railroads "resembles to-day nothing so much as an undulating line," and one might think by examining their charges that they could actually carry a long distance cheaper than for a short distance. Thus on the Michigan Central from Detroit to Chicago the charge is a certain amount per car, from Dearborn to Chicago it is very much more, but the railroad authorities will very kindly take the car from Dearborn to Chicago at through rates and billed from Detroit for $15.00 extra,—the amount it would cost to get it into Detroit. This is even below local rates from Dearborn to Chicago. This is a simple example of what is commonly practiced thoughout the whole country. Again this excessive railroad competition has doubtless led to the building of many roads which were not needed, and although they may have tended to build up competing points, they have been on the whole a tax on the community and have exerted a tendency to pull the whole railroad system into bankruptcy. Despite the evils of railroad competition which are many times greater than those of railroad combination, the cry has been continually for competition and against combination. Now I think that we can clearly show that the railroad wars have cost Michigan (not in dollars directly) more than any system of fair combination that could be devised. The tendency of every honest combination has been not to extort money from the public, but to place every town on a footing that its position and business deserved, that is to carry its freight at rates which bear some relation to actual cost; they would make each town pay for carrying its own freight, and do away with the unjust discrimination, by means of which some towns actually aid in paying the cost of freight from other towns, and some States actually help their brethren in other States to transport their produce. It is probably true that the freights would be somewhat raised at the competing points, and lowered at other points, but on the whole the average price would be somewhat higher, in fact this average must be raised or nearly every road in our State will soon change hands. (This can often be done by making through freight pay its proportion of the cost.) If this is done generally it will affect the consumer and not the producer; the farmers will receive just as much for their produce, the railroads will get better pay and the consumer will have to foot the bill. If railroad combination tends to produce extortion it will be generally felt and the law can prevent it.

As it is now, extortion in one place is offset by favoritism at another, and no law can be made effectual, or in fact can be passed. As has been before remarked the value of cheap rates of transportation is rather of comparative than absolute kind. It does not matter so much as to what we pay as it does whether we pay more or less than our neighbors. If we get cheaper rates than Ohio or Wisconsin we will get higher prices for our grains, if they get cheaper rates the reverse will be true. In order to see whether the State is benefited or not by excessive railroad competition, we must examine the neighboring States and compare them with our own. From the east, westward we find the grain producing or once grain producing states to be Massachusetts, New York, Ohio, Indiana, and Michigan, Wisconsin, etc.

Mr. Mathew Smith, a former member of the Massachusetts State Board of Agriculture, and a member of her last Legislature, told me "the effect of rail-

road competition on the farmers of Massachusetts had been terrible, many of them were actually destitute, situated though they were, in the center of Massachusetts, the freight rates to Boston were as high as from Chicago to Boston, and consequently Chicago prices were all that could be realized from their grains. They could not raise wheat on their land without artificial manure, and the price realized would hardly pay the cost. They were driven from grain raising to dairying, and at first did well, but the invention of refrigerator cars made this business a profitless one. They had tried market gardening, but soon found the whole country competing with them at that, and from that they could not live. What next they could undertake he did not know; it looked as though the whole farming community of Massachusetts would be rendered bankrupt. They were prevented from buying western produce cheap by the railroad companies charging $40 extra freight per car for interior towns than if delivered in Boston. (This extortion has since been stopped by legislation.)

In western New York and in portions of Ohio the same effect has been felt, though in a less degree.

Now what has been realized in Massachusetts may soon be realized in Michigan. Prof. Kedzie shows in his lecture that in a few years if railroad freight rates remain the same, the lower counties of Michigan must give up wheat raising as a profitable business. During 1877 nearly every railroad in the State apparently, though unintentionally, exerted itself to the utmost, by lowering through rates and *maintaining* local ones, to discriminate against Michigan.

The following table shows average of through and local rates in mills, for 1877 on some of our trunk line roads:

ROADS.	Average Through Rate per ton per Mile, 1877—Mills.	Average Local Rate per ton per Mile, 1877—Mills.	Highest Local on Grain '74.			1874. Average Local.
			5-20 Miles.	20-50 Miles.	50-100 Miles.	
Detroit and Milwaukee...	5.87	25.42	70	48	32	28.61
Michigan Central	7.2	19.91	70	48	38	23.4
Flint and Pere Marquette	4.4	22.20	70	48	28	22.19

From this it is seen that the average local is about five times the average through rate on both the Milwaukee and Flint & Pere Marquette, while on the Central it is less than three times.

The average local rate represents the average of the rate from all points along the line whether competing or non-competing, hence it is much less than what a non-competing point would have to pay. Since 1874 the railroad companies have not reported their highest freight rates, but as the average rate for 1874 on local freight is essentially the same as that of 1877, it will probably be doing no injustice to the railroads in assuming the highest grain rates for 1874 the same as those for 1877.

We should then have the following result:

Local Rate Higher Than Through Rate.

ROADS.	5 to 20 Miles.	20 to 50 Miles.	50 to 100 Miles.	Length Main Line—Miles.
Detroit and Milwaukee............	11 times.	8.2 times.	5.4 times.	189
Michigan Central	9.7 times.	6.7 times.	5.3 times.	270
Flint and Pere Marquette..........	16 times.	9 times.	6.3 times.	253

From this table it is seen that the Michigan Central makes the least difference with through and local freight and the Flint and Pere Marquette the most difference. From this it is shown on the F. & P. M. Railway that the producer 16 miles from Toledo (or end of road toward Toledo), must pay as much per car load as the producer at the other end of the road 253 miles off. That is so far as shipping rates are concerned the two localities, one 16 miles, the other 253 miles, are on an equality.

If we count the 60 miles of water route to Manitowoc in with the Flint and Pere Marquette Railroad its length is 313 miles, and the shipper from that point in Wisconsin is given equally good rates on grain with the shipper at a non-competing point 20 miles from the terminus of the road. Thus according to the story told by the rates they can carry grain just as cheap 313 miles as 20 miles.

What remedy is there for this state of things, is a question of a great deal of importance both as regards the welfare of the public and the railroad. Charles F. Adams, Albert Fink and various railroad managers believe it the province of the law to settle this question. C. F. Adams claims that the railroad legislation in Iowa was productive of much good, though he calls the members of the Iowa legislature grangers, and intimates that they were not possessed of much sense. (See "note A" for opinion of Mr. Fink). What we are suffering from is not so much extortion as unjust discrimination, which is building up other States at the expense of our own. It might be unjust to the railroads to prevent them from carrying through freight for just about one-half the actual cost. It may be unjust to the people of Michigan to be prevented from assisting their Wisconsin brethren in marketing their wheat. That question is not for me to decide, but if our railroads are to be kept out of bankruptcy, if our State is to receive her portion of the emigration, then some action must be taken that will give her all the benefits to which she is entitled by her position. This action probably should be in the form of a law, but I am not prepared to say what form it should take. To be just to the railroads it should not establish a pro rata rate, for transportation for a short distance costs per mile more than for a long distance. Neither would it be just to confine its operations to our own State, as railroad competition is not confined to limited areas. It is the duty and province of Congress to regulate commerce between the States.

Cost of Freight Traffic.

It would hardly be right to establish an arbitrary freight rate for the whole State, as the cost of operating the different roads varies between wide limits.

The following table computed from data given in the Railroad Commission-

er's report gives the expense of running and management of trains and the approximate cost of carrying one ton of freight one mile. The exact cost can not be computed for want of sufficient data:

RAILROADS.	Cost of running Freight Trains per Mile—Cents.	Total tons of Freight carried one Mile.	Average tons of Freight carried by each Train.	Average No. of Cars per Train.	Per cent of Cars unloaded in each train.	Running Expenses per ton per Mile—Cents.	Per cent of running expenses to whole operating expenses.	Total Operating Expenses per ton per Mile—Cost.
*Chicago & Lake Huron	*10.60	42,181,437	87	18	55	*00.12	56	00.23
Detroit & Milwaukee	78.33	36,864,322	121	25	56	00.64	45	01.35
Grand Rapids & Indiana	49.60	35,633,459	86	16	50	00.58	48	01.18
Lake Shore & Mich. Southern	58.25	1,080,005,561	190	28	39	00.36	54	00.70
Detroit, Monroe & Toledo	62.00	Not Reported.	-----	25	----	------	-----	------
Kalamazoo, A. & G'd Rapids	64.75		-----	20	----	------	-----	------
Kalamazoo & White Pigeon	64.75		-----	20	----	------	-----	------
Northern Central Mich.	59.50		-----	20	----	------	-----	------
Traverse City	38.30	250,754	27	----	----	01.42	50	02.84
Chicago & Lake Huron	*53.00	42,181,437	87	18	55	00.60	56	01.15
Flint & Pere Marquette†	------	------------	-----	----	----	------	-----	01.51

* The cost of running freight trains per mile on C. & L. H., although taken from the Railroad Commissioner's report, is certainly very much less than the full cost, for when substituting the values given as above it only produces about one-fifth the amount certified to by the Railroad Company as cost of conducting transportation. Increasing the amount given at the head of the table five times we get the more probable result, given at the bottom of the table.

† See note B.

From this it is seen that for the roads considered the cost of carrying one ton of freight one mile varies from seven mills on the Michigan Southern to 28.4 mills on the Traverse City. This may in part be due to the fact that the roads are not under one management, but that under the same management a great difference in cost still exists over different roads is shown by the report of Albert Fink when superintendent of the Louisville, Nashville & Great Southern R. R.

The following table gives the cost per ton per mile over the main line and over the different roads operated by that company:

LINES.	Cost per Ton per Mile—Cents.
Main Stem	1.78
Memphis Line	2.10
Nashville & Decatur	2.54
Knoxville Branch	4.17
Bardstown Branch	7.72
Richmond Branch	9.60
Glasgow Branch	19.10

The differences in the cost are caused mainly by differences in the amount of traffic over the various lines, although other considerations, such as grades, condition of road, rolling stock, etc., also affect the cost.

Distance also affects the cost of freight traffic, thus O. Chanute found that on the New York Central Railroad as the distance was increased the cost per ton per mile was lessened, as follows:

Distance, Miles.	Cost per Ton per Mile—Cents.	Distance, Miles.	Cost per Ton per Mile—Cents.
10	4.062	200	1.058
20	2.481	250	1.037
50	1.533	500	0.932
100	1.216	1000	0.932

Legislation.

Should legislation be deemed necessary it is seen that to be just it should not only be general in its nature but should come from the general government. It should require a rate somewhat in proportion to the cost. This rate could not be fixed absolutely, for the exact cost of freight transportation is an unsolved problem, but it could be fixed within certain limits and sufficiently near the cost for all practical purposes. This rate will increase as the distance is greater, but it does not increase in exact proportion to distance. The schedule of rates once fixed, should be adhered to, except in towns that have two roads, and there it should be departed from only far enough to let "the shortest route determine the rate." But in no case should freights be taken for rates below cost.

Again, there should be, as now, different classes of freight, which should pay different rates, because of their difference in value. The history of railroad legislation shows that such action must be intelligent, and only such measures adopted as are urgently needed. Railroad legislation has always been successful when it has been contented with the simple reformation of actual abuses; it has never been successful when undertaking to make railroads act in opposition to business principles. In this case both the welfare of the State and of the railroads seem to demand that an end be put to senseless competition and reasonless discrimination,—which are dragging the railroads into ruin, and affording some portions of our country advantages that are denied other portions, which is taxing our State for the support of our neighbors, building up competing points at the expense of non-competing points. It is certainly true that fair combination will settle this question, and will in time allow the benefits due to position, not to competition, but before the working of natural laws can settle these points, an irreparable injury may be done the State, in retarding its development.

Narrow Guage Railroads.

It had been my intention to say more in regard to the narrow guage railroads, but the discussion of the abuses attendant on railroad competition has taken so much time that I shall be oblige to close with a very brief statement in regard to them. Theoretically speaking the narrow guage (3 feet) as compared with the standard guage (4 feet 8½ inches) should cost both to construct and operate about 80 per cent of the standard guage. But for reasons which cannot be referred to here, the difference is found to be in actual practice more than 20 per cent. Supposing the saving to be only 20 per cent you can readily see that it would place our roads not only on a solvent basis but on a paying basis, and that too without raising the cost of transportion.

In regard to capacity it has been shown by experience that these roads can do an immense amount of business. The Festiniog railroad of Wales, with a guage less than two feet, carried in 1869, 136,073 tons of freight and 79,000 passengers, and was at no time worked to one-half its capacity. It has been stated and not denied, that a narrow guage (three feet) road could do the business now carried over any road in the State.

In regard to speed I need only refer you to the Festiniog road in Wales,

where with a guage of one foot eleven inches, a speed of thirty miles per hour has been safely maintained. The narrow guage road has been ridiculed and abused by engineers and railroad men generally. It was pronounced absurd when first proposed, and now that facts more than substantiate the theory, they are pronounced fallacious, and we are gravely told that because it succeeeds in one place is no sign it will in another. I propose to call your attention merely to a few facts, and from them you can draw your own conclusions. As for me, I firmly believe that the future (local freight) road of Michigan is a narrow guage road.

The following table, compiled from various sources, presents a comparison of a few of the American narrow guage roads with the Flint & Pere Marquette railroad, a road which very well represents the average standard guage road of the United States:

ROADS.	Guage.	Cost per Mile.	Net Earnings per Mile.	Net Earnings per cent of Cost.	Remarks.
*Denver & Rio Grande	3 feet	....	$16,572 00	....	Unfinished Route to the Pacific.
*Toronto & Nipessing	3½ feet	$15,724 00	....	....	Canada.
*Toronto, Grey & Bruce	3½ feet	15,750 00	835 50	.052	Canada.
*Bingham Canyon & Camp Floyd	3 feet	18,000 00	4,172 28	.232	Utah Territory.
†Toledo & South Haven	3 feet	6,157 46	497 28	.088	Earnings estimated by multiplying earnings for 3 mos. by 4.
†Mineral Range	3 feet	31,323 48	3,725 69	.087	In mountains of Upper Peninsula.
‡Festniog of Wales	1ft 11½in	$12,925 00 original cost, raised by earnings to $36,890 00.	3,719 30	.29½ on original cost, .12½ on total capit'l value, (£86,185).	In mountains of Wales.
†Flint & Pere Marquette	4ft 8½in	31,118 43	1,311 70	.042	One of our most prosperous local roads.

* Poor's Manual. † Michigan R. R. Report. ‡ Van Nostrand's Magazine.

In Norway railways of 4 feet 8½ inch and also of 3 feet 6 inch guage have been constructed by the same engineer and worked by the same manager. The following table from Vol. VII. of Van Nostrand's Magazine shows the average of six years experience:

	Guage 4 feet 8 inches.	Guage 3 feet 6 inches.	Difference in favor of Narrow Guage.	Narrow Guage per cent of Wide Guage.
Cost of construction per mile	$26,343 00	$17,143 00	$9,200 00	.65
Receipts per mile (alike)	27,600 00	27,600 00	....	
Maintenance per mile	7,173 00	6,565 00	608 00	.091
Locomotive expense per mile	9,426 00	5,760 00	3,666 00	.60
Receipts above expenses	$1,001 00	$15,275 00	$4,274 00	
Per cent of net receipts on cost	.40	.55	.15 per cent.	

It is to be noted that the narrow guage road in the above table has a guage of 3 feet 6 inches, instead of the usual 3 feet guage.

In conclusion we cannot do better than to refer to the seven points of advantage possessed by the narrow guage roads over the standard guage, as determined by the railroad convention held at St. Louis, in 1872. 1. Costing only about one-half as much as the broad guage, it is within the means of all sections to build them, hence will enable them to avail themselves of railway facilities, where otherwise they would be compelled to dispense with them. 2. From this small cost, light operating expenses and small interest account they will prove to be paying investments. 3. They will supply the great want of the age,—cheap transportation. 4. Cheapening transportation, they will develop dormant interests more rapidly than our present costly structures with their high rates can possibly do. 5. Their general adoption in sections without railroad facilities will enhance the value of properties largely in excess of their cost. 6. Penetrating these sections, and rapidly developing their resources by low rates, they will bring a large new business to the broad guage roads, enabling them to reduce their rates and thereby stimulate old and develop new interests. 7. A failure to adopt the narrow guage roads in the sections referred to will necessarily defer the construction of railways until such times as their means will admit of the more costly broad guage with its consequent high rates.

Signed by committee of eleven railroad managers and engineers.

The following books of reference were used in the preparation of this article: Van Nostrand's Engineering Magazine, Volumes 1 to 17; Michigan Railroad Reports; U. S. Report on Internal Commerce; Poor's Manual of Rail Roads; Railroads, their Origin and Problems, C. F. Adams.

NOTE A.—Mr. Albert Fink, of Louisville, Ky., now manager of the pool on west bound freight, and universally admitted to be one of the best informed men on the subject of freight transportation in the United States, as well as one of the best railroad managers; says: "It is this excessive competition and the ruinously low rates of transportation caused thereby, which reverse the natural order of things. And as this competition is spasmodic, often depending on the will of a single individual, the fortunes of people in great sections of country, the succes of their manufacturing enterprises, their prosperity, etc., are made dependent upon his slight threats. No wonder, therefore, that great complaints have come from the people who suffer under it, and that attempts were made to prevent the same in so many of the States.

Unfortunately, the people do not understand the causes and nature of the difficulties, and could, therefore, not apply the proper remedy. *It is the excessive competition, the unreasonably low rates of transportation on the competitive business, which is the cause of the difficulty.* The principle of proportioning the tax *according* to *distance*, to establish rates based upon mileage has been embodied in all the railroad laws that have been passed, and this principle, with proper modification, is no doubt correct; but instead of trying to enforce it upon the railroads of a single State, it should be enforced at the same time all over the country, not applying to way business alone, but which is much more important, to the competitive or through business everywhere."

There can be no objection to low competitive rates, but whenever made, they should be made under two conditions: first, they must be permanent; they should not be materially changed except the conditions respecting cost, etc., make a change proper; and, second, the rates to intermediate points should be reduced, if not in direct proportion, at least in some measure and upon some principle that would not work injury to intermediate points. No restrictions should be imposed upon a common carrier as to lowering its rates of transportation to any two points it may choose, but restrictions should be imposed forbidding it to make unjust discriminations at intermediate points.

There are other unjust discriminations made resulting from the same motive. The practice of making special contracts with some shippers,—the large shippers generally,—at lower than regular rates, and charging the regular rates to all other shippers. It is practiced to a great extent. The rates of transportation between two points should be the same to all shippers. In case of shipments on railroads in less than car loads, the cost will usually be greater than full car load shipments; but

where it is a question of one or more car loads, no additional cost is incurred by the railroad company; whether these shipments are made by one or more shippers it costs the same. There is no ground for discriminating in favor of the large shipper. There is no rule, no principle on which it can be established or defended. This policy of discrimination prevents the employment of small capital, and prevents the building up by slow degrees the industries of the country.

The people have either to be satisfied with all the evils of the transportation business, of which they have made such bitter complaints, and which they have so unsuccessfully attempted to remedy by State legislation, or they have to establish a judicious government over the railroads, compelling their proper management in the interests of the public, without interfering with the legal property rights of the owners of the road. The government has rights, and it is its duty to guard the interests of the people, when the owners of the railroad use their property to their injury; the same right that it has to prevent an individual from using his property to the injury of his neighbor's property; no one will deny that.

The question is merely, how is this right and duty to be exercised by the government? How is it to prevent the improper use of the railroad property, while it leaves its owner in the full enjoyment of it as long as they make proper use of it? That is the simple question, the proper answer to which constitutes the solution of what is called the railroad problem. And this is a practical question which I propose to solve in the manner described by an organized coöperation of the railroad companies under governmental sanction and control."

NOTE B.—*Cost of freight traffic* on the *Flint & Pere Marquette* Railroad, 1877. Elements for this calculation were taken from the Report of the Railroad Commissioner of Michigan.

Total tons of dead and paying weight carried one mile, 149,633,600.

Total tons of paying freight carried one mile, 27,148,939.

From these results can be deduced (knowing also the weight of empty cars) the relative proportion of loaded and unloaded cars, which was found to be 3.511 empty cars drawn for each loaded one; consequently if the cars are all full going east, only about one-eighth are full in returning.

From the data furnished in regard to the passenger department, it is also computed that for each passenger, there is drawn 3.598 tons of dead or non-paying weight.

The main difficulty in the solution of the question regarding the cost of freight traffic is found, in the separation of the expenses of the passenger department from those of the freight department. As it was found impossible to do this with any degree of accuracy in regard to some elements, the method was adopted of dividing the total cost in various ways, of those elements in which the proportion was doubtful; then taking the sum of the maximum results thus obtained, also the sum of the average results and the sum of the least results, and by so doing ascertaining the maximum error. The elements of cost were divided on the basis of tonnage, mileage, receipts and work, or product of tonnage by speed.

The result was as follows:

COST OF FREIGHT TRAFFIC.

Class.	CHARACTER OF EXPENDITURE.	Average Amount.	Greatest Amount.	Least Amount.
1	Track Bridges, fences	$91,438 82 7,931 29	$124,880 23	$95,430 09
2	Maintenance of rolling stock	58,080 09	66,851 20	46,279 79
3	Conducting transportation	213,646 56	213,646 56	145,731 23
4	General expense	39,142 36	39,142 36	39,142 36
		$410,239 12	$444,520 35	$326,583 47

Total number of tons of paying freight carried one mile, was 27,148,939, and consequently the cost per ton per mile was in cents, as follows:

Average, 01.51; greatest, 01.64; least, 01.24; and consequently the probable error is very small. The average cost of moving one ton in weight, whether dead or paying, was 00.281 cents; the maximum, 00.296 cents; the minimum, 00.22 cents; or from 2.8 mills to 2.2 mills.

Hon. Wm. L. Webber gave the following address, on

DRAINAGE.

Mr. President and Gentlemen:—The subject of drainage is so extensive that a full treatment of it would require volumes. It is not my purpose to undertake to cover the ground; I shall be satisfied if I furnish a text to be amplified and illustrated by discussion.

That a vegetable will not grow without water is a fact known to all; that vegetables, such as farmers grow for profit, will not grow in the water, is equally well known.

By far the greater portion of the farming lands in the Saginaw valley have a subsoil of heavy clay through which water will not pass with facility. The general surface is level, with fall enough, however, for drainage in proper water ways, but before such water ways are constructed, the water that falls upon the surface must evaporate. Suppose our average rain fall to be thirty-five inches annually, about three feet deep of water falls each year on every square foot of our territory. After land is cleared, even without drains, a considerable portion of this will work off on the surface, but a large quantity of it is left yet to be disposed of by evaporation. Now, how to preserve sufficient of moisture in the soil for the use of vegetable growth, and yet not have too much, is the problem we wish to solve by drainage.

Suppose you make an under-drain three feet deep; if well laid and working freely, water falling upon the surface, except in the severest storms, will find its way through the soil to the drain almost as fast as it falls upon the surface. This under-drain, being three feet deep, had already, before the storm came on, exhausted the soil within its immediate vicinity of all surplus moisture, and the under-drain is there continually for the purpose of relieving the soil of this surplus moisture. As the water falls it finds its way into the under-drain as its true and proper outlet to water courses, and leaves in the soil just so much water as the soil has natural capacity to hold, and that is just what the vegetable wants for its own use. It has been demonstrated that the roots of vegetables strike deeper in a well drained soil than in one not drained. The rootlets of vegetables will not go below the water line. Another fact in this connection,—the water going from the surface to the drain below carries warmth with it and warms the soil. It is sometimes regarded as surprising that under-drained soil should stand drouth better than one not drained. The wonder ceases when you consider the fact that the roots of the plants strike deeper and are constantly in a moist soil, no matter how dry the surface may be.

I have spoken of the water line in the soil. I will dwell a moment on that point. Suppose you take a glass jar six inches deep and fill it with earth; now pour water upon that earth in the jar and the water will spread itself about until you have filled it to saturation. Whatever the soil will not hold, will will settle to the bottom. Continue to pour water in your jar until you have left but two inches of the surface above the water line; you have then two inches of earth filled with water to saturation, and what is below that line is immersed in water. With our clay subsoils this is about the condition of very many fields,—the upper six, eight, ten or twelve inches saturated after a storm, and all below that immersed in water. To heat that water below so as to cause it to evaporate is practically impossible; for however hot the rays of the sun may be it is a well known fact that in philosophy that heat will not strike downwards through water. The way evaporation is carried on, then, is that the surface of the earth becoming warmed by the sun evaporation takes

place, and this cold water from below is brought up by capillary attraction to take its place, and this process continues until the next storm. Note the difference; the one process bringing up cold water from below keeps the soil cold, while the other carrying water from the surface downward warms it to a greater depth. Suppose a drouth comes on; the rootlets of the plant have not gone below this water line and consequently are more liable to injury than where under-drainage has prepared the earth to a greater depth for plant life, and the rootlets may be found two or three feet below the surface.

But in this age, arguments in favor of drainage can hardly be necessary. Every man of any observation has settled that question and he has, troubling him, only these questions: How shall I drain, and can I afford it? Will it pay? These are questions that every man of common sense and good judgment must settle for himself after considering his situation. It is not every man who can afford to under-drain his farm at once, and very many must content themselves with surface drainage until they can better their condition, or perhaps until the stumps are out of their farms, or until suitable outlets can be secured, etc. I believe that under-drainage as a rule will pay twenty per cent on its cost in increased production; but notwithstanding that, I would not advise farmers to run in debt for under-drainage, but would advise them to keep it constantly in mind and as fast as they can, without incurring debt, put it in practice. It would cost but little for one to determine a system of drainage for his farm, and that once done, work can be put in from time to time as opportunity offers of working out this system, so that when it shall be finally completed it will be a perfect system of drainage for the farm. There is nothing where previous calculation and systematic work pays better than in under-draining. If one contemplates engaging in it I should say, first, buy one or more books treating on that subject and study the subject. There are three, perhaps more, good books on this subject within every farmer's reach, at a cost of about a dollar or a dollar and a half each: French on Drainage, Klippart, and Waring, and either one of them is a full instructor. If one should buy all three he would be likely to find some ideas in each not found in the others, and it will be money well invested if he will study them carefully. The next step is to settle upon the place or places for outlets and take the levels of the farm. Where the services of a civil engineer can be secured it will cost but a trifle to have those levels taken on cross lines, say every fifty feet, and marked on a map. When this is done you know exactly what you have to do. Your farm, so far as you propose to drain it, is mapped in fifty feet squares, and the relative height of each is marked at the intersection of these lines. When you come to dig your drains you know precisely the depth you must go at each point to give a uniform fall, and the saving of labor and the avoiding of mistakes by this course will make the leveling of the very first consequence.

In our clay soils, in digging the ditch to lay tile, I would advise three feet as the most desirable depth. At the same cost, four feet would be better, but the additional foot increases the cost, in my judgment, beyond the advantages. If you conclude to dig three feet, make your ditch twenty inches wide on the surface and four inches wide at the bottom. You will remove in opening this ditch three cubic feet of earth for every one foot in length of the ditch. Of course, you will use ditching tools. There is one which I have never seen on the market, which might be called the finishing tool, and which I regard as so essential that I will describe it. Suppose a length of stove-pipe four inches in diameter, thirty inches long, cut in the middle longitudinally. The half of

this pipe describes the scoop. You can get one made from a mill saw. It should be a little thicker than the sheet iron, should be sharp at both ends, and the handle should be fastened to it in two places on each side near the center, to give it sufficient strength, and at an angle of about forty-five degrees to the level of the scoop. The handle being of sufficient length, when the ditch is dug, one person with this tool, running it in the bottom of the ditch, by working both ways will make a uniform trough or bed for the tile. The outside of this scoop should be the same size as the outside of the tile to be laid; and the tile being thus firmly bedded in the clay, there is no danger of lateral motion or of their getting out of place in any way. The tile being laid, take of the clay thrown out of the ditch, enough to fill, say six inches over the tile and pack it carefully. The object of this is to keep sand from getting into the tile. Of course, if the drain is being put in sandy soil these directions will not be found of use. Some have expressed doubts whether the water would find its way into the tile if the clay was packed as suggested, but no fear need be entertained on that account. After the packing to keep out the sand is done, the remainder of the ditch may be filled up with a plow or scraper, or any other way, as is found cheapest.

In regard to the fall necessary for the tile drainage, a good fall is desirable, and you can make smaller tile do the work with a good fall. But tile drainage is desirable even if your land be a dead level. And here again I call your attention to the water line in the soil. Suppose you have a ten acre field with tile drains laid through it; it has a clay subsoil and is perfectly level; suppose there is no outlet, so that your tile drains have not opportunity to work; a heavy rain comes on and fills the earth with water to within six inches of the surface; your tile are laid three feet below the surface. Now open an outlet at one side of your field and connect with the system of tile drainage, and your water will pour out of that outlet under a head of two and a half feet just as certain as it would if you should bore a hole in the side of a barrel two and a half feet below the surface, and it will continue to flow through that system of tile drains so long as the water line in the soil is above the outlet. But if one lays tile on a level greater care must be taken to pack the joints, and a larger tile should be used to obviate the danger of their filling with sand. With a good fall, sand in the tile will wash out and fall into the first silt basin prepared for its reception; but of course in a level drain sand will be more likely to accumulate.

The question of cost every one must settle for himself. It will not be alike in any two fields. The surface of the ground, the convenience of the outlet, the character of the soil,—all have to be taken into consideration.

Round tile well burned and free from defect is the only kind that I would recommend to be used. They should be examined carefully before being laid. If there is a lump of unslacked lime in your tile which will break it when it comes to be wet, it would make an obstruction in the drain which it might cost you days of labor to find. If there be any doubt that the tile being free from lime, you can settle it by placing them in water until they become wet through. If there are lime pebbles there the slack of the lime will break the tile.

The tile on the ground will probably cost from ten to fifteen dollars per thousand feet, depending on size and expense of transportation. The cost of these drains would vary from thirty to sixty cents a rod, but when once well laid, with good tile and with outlet suitably protected, they will last for years.

DISCUSSION.

Dr. Smith said he had a farm of 70 acres that he had cut out of the woods. The subsoil is a stiff clay and holds the water long. He tried to raise wheat before doing any draining, and had raised 36 bushels from ten acres,—now that same ten acres is thoroughly drained and has produced 42 bushels to the acre.

There was a low place in my orchard where I could not succeed in making trees grow. Four years ago I ran a drain through it and planted trees; they are doing well.

Dr. R. C. Kedzie—It is not generally understood why the soil is so much warmer for being drained. There is a vast amount of heat used up in evaporating the water. It takes 6.7 times as much heat to convert water into vapor as to convert ice into water.

AFTERNOON SESSION.

Hon. B. F. Partridge read the following paper on the

GROWTH OF FRUIT AND FRUIT TREES.

Mr. President, Gentlemen and Ladies:—Having consented to write a few lines on the subject of planting and raising fruit trees and fruits, I will try to read to you what I have hastily prepared, condensed as much as possible. So much has been written and published in books and newspapers that one hardly knows, in this age of printing, where to begin; but I will give you what I have thrown together in my feeble way, and what I think every one should know. It seems to be a fact that common subjects require the greatest amount of study to put them into proper form, for the consideration of those commonly using them.

The raising of fruits and fruit trees seems common enough, as nearly everybody makes *some* effort to produce fruits. Many more have failed than have met with any degree of success,—while *some* have seemed to possess all the secrets of success in this fascinating pursuit.

Now this fruit raising is no paradisean occupation, I assure you, when properly carried on. The historian and even the general observer of human progress ere this has discovered that no advance has ever been made that did not cost the best efforts of the best talent in the land for the progress,—so it will readily be admitted that no improvement in the culture of fruits has been made without the best efforts of the most patient, persistent and talented horticulturists; nearly all fruits *were* of very indifferent quality, until our civilization demanded better and greater varieties, when talents and experiments came to the front, and through a long series of years of study and anxiety the skill and labor of many bestowed upon the *plants of culture* has given us every variety of good fruits in the greatest abundance.

In this region less than twenty-five years ago, there were not five hundred fruit trees all told. Look about here now and you will see innumerable orchards and fruit gardens to fill the spaces where then a dense forest covered the land. The Romans esteemed apples an important and valuable article of food. If so then, is it not now the duty of every cultivator of the soil to plant and cultivate fruits.

The mental, the physical, the moral qualities of our nature are wonderfully promoted by the cares and labors of cultivating fruits. Just imagine the expectations, anxieties, hopes and fears incident to the planting and raising, during the long years required to produce the first crop of fruits, the first apple or pear; their growth watched till the hour of picking.

Horticulture in all its parts I do not pretend to cover in this paper,—neither is it my purpose to cover all the subject of pomology.

It would perhaps take more time than I have, and more ability, to give you the whole subject in such language and classic style as the subject will bear; so that only the way to plant trees in this region and treat them after they are planted, in order to grow the fruits, will be treated in this paper,—which will include selecting, purchasing, receiving and unpacking, putting them in shape to plant, then planting, then trimming and their subsequent proper care.

As human activity is like the fertility of the will, so is planting orchards to growing the fruits after. When the disturbing process is over, the fruit like the will reappears.

The climate in this county seems all that can be required to produce apples, pears, plums, quinces, and small fruits.

The soil is here that seems just what will produce all these in perfection. Not all the soil will do it, though it is claimed that almost every kind of soil will raise good fruit. The experience of the many does not sustain this claim.

When I came to this county, many years ago, there were peaches growing in perfection; no apple or pear trees had produced much fruit; but peaches seem now to be too tender, while the other fruits named grow to perfection.

The selection of the varieties should be the first consideration. If you don't know what varieties to select get some one who does know which are best for this climate, and the best varieties of them for the seasons you desire. Early autumn and winter, for apples and pears. For plums you will consult those who know which varieties will sell best and their seasons. Quinces will be all the same, apple quinces.

Before you order trees be sure to select your piece of ground where you intend to plant your orchard. Measure off the rows each way and get twenty-five or thirty feet outside of the rows each side of your ground, and then prepare the land by plowing very deep; if sod, subsoil plow it; if stubble, the deeper you plow the better; do this in the fall.

The next spring plant corn or potatoes with heavy manuring; give the crop clean culture; take off the crop, and fall plow in lands as wide as you intend to plant the rows apart, leaving the dead furrow exactly where you want your rows to be, and make your dead furrow as deep and clean as you can. After all this is done lay out your orchard by driving stakes—good oak stakes—in the dead furrow, just where you want your tree to stand; drive these stakes down solid and then dig a large place, say four feet square and two spades deep, around these stakes, leaving the dirt in one pile outside of the dead furrow to freeze during winter, and put half a dozen large shovels of old manure in the bottom and let it be there all winter to saturate the ground—and fill the whole length of the dead furrow with any barnyard manure and let it be there. Your orchard ground is now ready for planting the trees.

In February send to some reliable nurseryman, in about the same climate as yours, for a wholesale catalogue of fruit trees, and select from the three-year-old list of pears and apples the varieties you have already concluded to plant, and order direct from the nursery, sending the money with the order, giving directions carefully what kind of trees you want; and say you want them pack-

ed with great care and labeled with name on each variety, and forwarded by most direct route by rail, sending you notice by what route, so that you can take care of them while fresh.

As soon as possible, after received, open the packages and place in trenches, and over the roots and part of the body of the trees pack the earth, after putting water on them, very tightly around them. If any of the trees are dried or shriveled up, when opened, cover the whole tree in a trench for a few days.

If the trees or plants are in bad condition, when received, notify the nursery man at once and ask him to stand a share of the loss, and he will do it.

Now take a fair dry day to plant your trees in and don't hurry your work; first make a hole in the ground about two feet deep and two feet square near where your trees are, and they should be on the orchard ground; fill this hole with water and stir up from the bottom (we suppose this soil is clay loam) the clay till you have a thick batter; now take a sharp knife or a pair of sharp pruning shears and cut off all the ends of the roots smoothly and as soon as done plunge the roots into this hole of batter for a moment, and throw some rich earth into the hole on the old manure and put the tree into the place carefully where you intend it to grow, and fill the top earth around the roots carefully by hand till the hole is nearly filled, and gently press down with the foot, throwing some loose dirt on last, leaving the top of the ground a little depressed around the tree, and the tree six or eight inches lower than it stood when taken up. Now when your trees are all planted, take your pruning shears, not a knife, and gently clip off all dead and broken limbs and some of the lowest ones, leaving a pretty good head in order that there shall be leaves enough to supply the necessary moisture to the roots.

After this is done and you have put some covering over all the wounds made by trimming, prepare a kettle holding about a pailful of strong soft soap, just thin enough to run, and with a stiff brush (the end of a corn broom tied closely is best) to put on the soap with, and paint each tree from the ground up in among the limbs, leaving as much soap on as you can.

The tree should be set on the northeast side of the stake so that you can tie it up if needed. If well set tying will not be required.

Then plant the ground to corn in rows, both ways, so that the tree will fill the place of one hill of corn. Next cultivate the corn both ways and hoe the trees as well as the corn. When the corn is ripe pick off the ears and leave the stalks standing all winter. The broad leaves and high corn in summer will shade the trees and the stalks will prevent the wind in summer and winter from raking through the orchard and causing the trees to lean.

Continue the cultivation of trees and corn until your trees are in full bearing, manuring the land every fall and plow it in the spring.

Pear trees will be treated in the same way except that you will plant broom corn among them in drills and give clean culture, leaving the stalks standing. The broom should be cut early and taken out of the orchard to cure, if desired for brooms, but if the seed is desired let it nearly ripen and then lop it over and leave until late; then gather leaving the stalks standing until spring, when they should be plowed in, manuring at the same time.

Plums and quinces will be planted and treated in the same way.

Many theories have been published about the aspect of trees. Now this region is almost one vast plain, where the timber has been removed, and as level as can be, and the only way to change the aspect to get a southern or northern or an eastern exposure is to plant trees on the side that will give the desired aspect. If I should plant one it would be on the south or west side,

more for a wind break than anything else. The southwest being the prevailing wind here and the coldest during winter, seems to require some attention in reference to planting orchard trees.

It is my opinion that every fifth row of trees should be a row of evergreens; the most rapid growers. The white cedar here would give ample protection, if planted thickly in its own row, say in the row five feet apart; this row when grown up will answer for a wind break and add the most beautiful ornament to the orchard. These evergreens grow as fast as the orchard trees, if cultivated as well.

Since we have got the trees in the ground, let us see about the care of them. The trees were painted with the best soft soap and left to grow. In July apply one more application of the soap, examining the trees and rubbing off any unnecessary sprouts and shoots, and also destroying any worms or caterpillars, and you may find some of the cecropians, a large green worm, about four inches long and full half an inch thick, beautifully marked. The moths are sometimes five or seven inches across the wings.

The first application of soap has the effect to destroy any young borers of the year before and any eggs that may have been laid in the bark, as the alkali or combination of alkali and grease will penetrate to the wood of the tree and mingle with the sap and thus supply a concentrated food for the growth of the tree and poison for the borer.

Many orchardists avoid planting pears because of so much doubt about anything like success in their continued growth and production of fruit. In Bay City, last year and year before, nearly all the pear trees blighted and were lost, while mine, some 500, were all saved but two, which were not noticed until too late. Some thirty commenced to turn black and I prepared my soap, adding a little copperas dissolved in water, and painted the trees every week for two months, when the trees had all put out fresh leaves, and sprouts from some of the limbs had grown several inches; and the trees are growing thrifty yet.

If this soap (not soap-suds) is applied in May and July, every year, the borers will not be known in your orchard, and it supplies a food and manure applied more directly to the tree than can be done in any other way, and when applied in May it courses up the tree in the sap to invigorate the whole body, limbs and leaves, and the July application renews the strength and returns with the sap to the roots, in turn furnishing the entire plant with such food as it naturally requires.

This mixture will have an equally good effect upon all deciduous trees (that is all but evergreens, and I have no doubt of the same result with them.)

As this subject cannot well be too much drained of its impurities, so the orchard can not well be too much drained of its surplus water. Where the land is filled with water not much air finds its way to give life to the soil. Surface drains help very much, but fail to let the water out from the roots, for no crop can be successful in land that is subject to frequent drenching with a surplus of water that stands for weeks, causing fermentation and souring the organic matter it contains. The fruit tree is not a success in that soil. So sure as continued wet feet is the cause of consumption in a delicate young lady, so sure will the fruit tree die with consumption, if too much water and wet feet be allowed.

The soil has very much to do with the successful growing of fruits. It seems that some begin to have doubts when so many requirements are stated, but some one has said that no practical fruit grower should ever let a word

come out of his mouth that is not strongly tinctured with sense, so my advice shall contain the most sense in the fewest words that I am able to command.

The calcareous soils are strongest and best for fruit, tree fruit, but thoroughly underdrain them: feed them about a bushel of salt to the acre every year for orcharding; the pear, quince, and plum especially; at the same time apply three or four wagon loads of ashes yearly to the soil and give the soil a liberal supply of manure; plow and hoe them all in and your soil will richly reward you for your liberality.

It seems necessary to come down on the apple tree borer. There are two kinds, and very destructive I have found them both. One lays its eggs singly on the sunny side of the tree rather low down, hatches and enters the bark, where as footless as a tadpole it feeds awhile; as it grows it works upward and deeper until it penetrates the wood, leaving a round hole. This grub remains as such for three years, when it comes out a brown beetle, lays its eggs, and dies.

Another kind is nearly similar to the saperda, but attacks the tree rather higher up, in fact all along the sunny side, and the black beetle, about half an inch long, may be seen toward the last of May and through June and into July, running up and down the body of your trees, finding places to deposit their eggs, when they hatch and penetrate to the sap and work about under the bark, sometimes completely girdling the trees, but commonly working on the southwest side of the tree, leaving, where they penetrate the wood, an oblong or nearly flat hole. Wherever you see on the body of your tree a spot of depressed bark, be sure there is a borer there, and the war should begin at once.

The cecropia only strips the foliage from the tree, finds a place to spin its cocoon, and begin its transition to that of the largest species of moth.

I caught one of these worms and took it to the house, placed it on a raised window, when it made its way to the under side of the upper sash and commenced its cocoon, and it is there now. I had one hatch last year and year before in the house.

The next worms seem to be the tent caterpillar and fall web worm and the canker worm, and you must hand-pick or burn them with a kerosene or benzine lamp, held upon a pole to reach them in their nests, where they are easily destroyed, but it requires constant watching and warfare to rid your orchard of these pests.

The bark louse can be easily cleaned out by the soap wash.

But the codling moth is the most fearful and hardest insect we have to deal with among apples and pears, and therefore merits some notice, but not being a scientific entomologist it will get sparingly noticed. It seems that it is rapidly increasing in this country, and very little perfect and sound fruit is found in the markets. The egg is dropped in the blossom end of the fruit very soon after it is set; the warm weather hatching the egg, the worm very soon finds its way to and about the core and finally gnaws through the side of the fruit and finds its way down the limbs to the coarse bark, and gets under the scales of the bark to spin its cocoon, and comes out in the spring a moth ready to drop her eggs again; some find their way to the ground in the apple and crawl out to find a resting place.

All wormy fruit should be gathered as soon as it drops, and fed out or otherwise destroyed, and traps placed in the trees to catch the worms, and lamps or fires lighted in the orchard to catch the moths in the night time.

Some years ago we were very much troubled with the geometrid or span worms, but they are more easily disposed of, and will not receive a biographical

sketch here. Many other worms and moths of note might be mentioned, but having adopted the same plan with these robbers of our money and labor that the compiler of the legislative manual has ever done, I will here finish regarding the most noted of these insect fruit destroyers.

There are numerous insect friends as well as foes. Some of these insect friends are properly called scavengers, because they consume decaying matter; some live upon other insects that destroy our fruit, but cannot be further noticed here.

The nosology of vegetation is not particularly under consideration, hence I cannot enter particularly into the merits of this part of the great difficulties of fruit growing. The cultivator must study his calling and gain his information by mental and physical labor.

The cultivation of fruits requires great courage; no cowardly fellow need commence it; should he commence he would be like the cowardly fellow who once resolved to make a campaign but when he was started the ravens began to croak and he laid down his arms and stopped, utterly refusing to go further. This is the way many have set out in the business; some as amateurs and some for profit and a regular business; and because some of their results were badly threatened with disaster, concluded to never go further in the business, loosing all they had put into the business and the little valuable experience already acquired. It seems to me I see one amateur pear grower present of this cowardly crew. Sometimes I feel like saying "a coward" to those who might with much benefit to mankind set an example in the planting of orchards, when the only excuse for not going into it is their doubt of perfect success, but this might be too severe; so in this case examine not whether I am severe upon you but whether I am so for your own good.

It is gratifying to notice the rapid strides that are being made in improvement in the horticultural pursuits in this and adjoining counties, the favorable change which is taking place throughout in bringing to the greatest perfection all the agricultural as well as horticultural pursuits, the elevating influence bearing upon everything pertaining to agriculture is flattering. It has become quite fashionable for the professional, the mercantile, the mechanical, and some of the lumbering interests to engage in farming, fruit-growing, and stock raising: some few as mere amateurs, but the most in good earnest.

It would be extremely gratifying to a very large portion of the tillers of the soil to know, from those who have had more experience and who are more able to express in proper language, just how to manage, in the most economical way, compatible with success. We have a well organized agricultural society here but no pomological society seems to have entered the heads of our people. Too much importance cannot be attached to this subject.

The meteorological conditions of this section the past year have been quite satisfactory; all crops have matured fully, and especially fruits.

Any failures can fairly be attributed to a lack of care in cultivation: those in the highest cultivation and soils of the richest character having a power of resistance and a recuperative energy, which insure good crops under circumstances apparently adverse. The observations of all intelligent cultivators attest the value of perfect drainage and good culture in warding off dangers from drought and excessive moisture, especially in the level but extremely rich soils of this region.

It seems to me that it should be the province of the agricultural chemical laboratory to institute an elaborate analysis or examination of the leaf, stem, and fruits of the tree and vine at frequent steps of its growth, so that any

new analogies in pomological physiology may be learned, that the origin of the numerous diseases incident to fruit trees and vines may be discovered, if possible, and such information spread abroad for the greatest benefit to the greatest number.

In conclusion it would afford me much pleasure to see every ardent tiller of the soil make it his duty in all his spare time, to study agriculture and the allied sciences of pomology, entomology, agricultural geology, microscopy, and natural history, all valuable to every intelligent tiller of the soil.

DISCUSSION.

Hon. Nathan Knight.—A very small percentage of the trees that had been shipped to this place from the nurseries would be found growing to-day. The principal causes of this are:

1. Planting on soil that is not in proper condition;
2. Not planting in a proper manner; and
3. Not taking proper care of the trees after planting.

Very few of the fruit trees planted in this country did any good until we commenced underdraining. But when underdraining had been done and trees properly planted and cared for afterward they invariably did well. In the peach belt the crop fails about every third year, and now their orchards are being destroyed by the "yellows." In Bay county we can have peaches every alternate year, and could be profitably cultivated.

Mr. N. Chilson said he had considerable experience as a fruit-grower in Calhoun county. During last summer he had traveled a good deal in Bay and adjoining counties, and was delighted to observe the excellent quality of the fruit in these counties.

David Geddess, of Saginaw, said that although troubled with the curculio he had succeeded in raising some excellent plums. He practiced jarring the trees and catching what he could. He did not believe in manuring trees quite so much as Gen. Partridge advocated. He thought once in three years was sufficient; found it did well with his orchard. He said that the ends of the small limbs were dying in many cases and he thought it was caused by forcing growth too much with manure.

Gen. Partridge said this was not caused by manuring, but by a small insect boring into the limbs.

Mr. Guild said that the only successful method yet known of dealing with the curculio was the "jarring process," and for the codling moth bandaging the trees. He recommended mulching with ashes as good for the trees and the same time destructive of insects.

Dr. R. C. Kedzie gave a lecture on the "Capabilities of the soils in the northern counties of the Lower Peninsula." (See lectures given at more than one institute.)

Mr. John M. Waterberry, of Bay City, read the following paper on the

VALUE OF MICHIGAN LANDS AS AFFECTED BY CLIMATE AND MARKETS.

One of the first questions that will be asked by any person who is considering the feasibility of purchasing a farm in this country is, "Will it pay?" "Can farming be made to pay in the Saginaw valley as well as in other States where land can yet be purchased at reasonable rates?" The question is vital, and fortunately can be answered in the affirmative.

The fact has been ascertained by a system of reports from all the States to the agricultural department at Washington, that the value of farm products

per acre in the State of Michigan is much larger than in any of those States famed as the gardens of the West. The States with which I make comparison in this statement are Wisconsin, Minnesoto, Illinois, Iowa, Kansas and Nebraska.

By way of showing the superiority of Michigan in a manner at once concise and conclusive, I will give a few of the figures as found in the department reports.

The average for five years, from 1871, of the cash value per acre, of corn, wheat and oats was as follows:

STATES.	CORN.	WHEAT.	OATS.
Michigan	$17 37	$16 66	$12 49
Wisconsin	14 74	13 31	12 23
Minnesota	14 01	12 86	11 46
Illinois	10 05	12 74	8 34
Iowa	9 58	9 15	8 77
Kansas	10 19	14 95	9 04
Nebraska	8 45	8 73	8 20

It will be observed in the matter of corn, that Michigan leads the next best State, nearly eighteen per cent; in wheat nearly the same, and in oats has a substantial advantage. If we make the comparison with the average of six States we find it to be nearly thirty-five per cent:

Michigan	$154 43
Wisconsin	141 83
Minnesota	128 06
Illinois	124 76
Iowa	101 95
Kansas	130 92
Nebraska	101 61

Showing Michigan to be nine per cent better than Wisconsin, which State makes the second best record, and twenty-seven per cent better than the average.

Taking the average value for five years of all crops per acre, we have:

Michigan	$17 19
Wisconsin	13 89
Illinois	11 12
Kansas	10 48
Nebraska	8 56
Minnesota	11 93
Iowa	9 47

By this statement Michigan is recorded twenty-four per cent better than the next best State, fifty-seven per cent better than an average of all the rest and one hundred per cent better than Nebraska, a State to which the tide of emigration from the east has long been setting, attracted by the advertisements of the railroad companies. By extending our comparisons so as to embrace other States of the west and south we will find no State with a record to be compared with our own; in fact, by embracing them the general average is found to be much lower than when only the first mentioned States are considered.

At the time this paper was prepared I did not have the reports for 1877 at hand, but on Monday obtained a copy, and have extracted a few totals which show that the superiority of Michigan is constant and that it occupies the same vantage ground in 1877 as in preceding years.

STATES.	1875.	1876.	1877.
Michigan	$17 53	$14 46	$15 63
Ohio	13 55	12 96	13 34
Indiana	12 00	10 63	11 42
Illinois	11 46	8 10	10 04
Wisconsin	13 08	10 93	11 10
Minnesota	12 70	8 30	12 79
Iowa	8 60	7 30	9 09
Missouri	10 59	9 18	9 68
Kansas	9 51	10 37	8 39
Nebraska	7 28	6 40	7 89

I add a table showing the average cash value per acre for principal crop for 1877:

STATES.	CORN.	WHEAT.	RYE.	OATS.
Michigan	$12 09	$21 35	$10 24	$11 10
Ohio	12 60	18 60	8 77	8 96
Indiana	10 20	16 38	8 40	6 00
Illinois	8 41	17 16	9 00	8 14
Wisconsin	9 24	13 95	8 06	8 28
Minnesota	11 02	16 83	8 32	10 38
Iowa	8 12	12 61	....	7 60
Missouri	7 83	14 00	8 21	6 93
Kansas	7 66	11 07	7 20	6 84
Nebraska	6 84	12 45	....	6 00

It will be seen by the above comparison that the land was maintained in 1877, with the exception of corn in Ohio, when there is the slight advantage of fifty cents per acre (but then Ohio is a corn state). In wheat, however, Michigan is accredited with a handsome majority over all, the same being true of other principal crops.

The Saginaw Valley is no insignificant quantity in the total. I will refer you to the wheat map of the State, by consulting which you will find that the counties lying within its bounds produce more wheat per acre than any other counties in the State.

These comparisons are convincing arguments of themselves, but people in general desire to know the reasons why as well as to learn the facts, a wish which is not at all difficult to gratify in this case.

The causes which tend to produce this condition of superiority in our State are varied, some of them have been set forth most clearly by gentlemen who have preceded me, and others may be shown hereafter; but it is my pleasure to call attention to two reasons, which are of such a nature that they may safely be considered as constant, and we be entitled to the inference that as they have tended to produce this condition in the past, they will continue to do so in the future. I refer to markets and to climate.

In all thickly settled communities by far the larger amount of produce raised is shipped to the east, and now that Great Britain is drawing upon us for a vast amount of food, this fact becomes of greater importance. It necessarily follows that the nearer we are to those points where our productions are consumed, the greater will be the cash value of crops when ready for market, by just so much as the cost of shipment is less than from those points farther

removed, or possessed of inferior facilities for transportation. What are our facilities? In the southern half of the State is the broad net work of railways, which gather up the products of the soil and hurry them to the seaboard, Our commonwealth has at its base, trunk lines whose means of transportation are unlimited; that can take the yearly crop at almost a moment's notice and in few hours deposit it among those who offer their gold in exchange; and besides possessing these means it must be remembered that the hundreds of miles which intervene between us and our markets, grow to be thousands to the hurt of our western brothers. Some of you may think that the offices to be expected from railway corporations may not always be kindly, and so I will remind you that five-sixths of our boundary is on the great lakes, with innumerable harbors where vessels of greatest capacity can ride, from whence the products of our industry can be sent to the markets of the world, without let or hindrance of the railway monopolies in other States. I have considered this fact of facility of transportation as affecting Michigan at large, the Saginaw valley having her part in common with the other portions of the State; but it is well to call attention of those seeking new homes, to the truth that the local markets of Saginaw valley will command all the products of our soils for years to come. With enterprising and growing cities already demanding more than we can produce, with the limited acreage under cultivation; with villages springing up on every hand which will some day deck the broad areas of waving grain as diamonds in a golden setting, we have but little need to consider the markets abroad, only as they affect our children, for our home markets will be our best markets for years.

Markets affect the value of farm products after they are harvested. There is another cause, however, equally potent in its effects upon profits of agriculture, which is not affected by caprice, but is as sure as the rising and the setting of the sun.

It is probably safe to say that the sales of the different parts of the globe do not materially differ from each other, but the productions of the soil vary in a great degree. This difference in growth of vegetation is due to the effects of climate; and observation has shown that those countries where there is an equable temperature and a humid atmosphere, are best adapted to agricultural purposes. It is quite true there are other and peculiar conditions adapted to specialties, but for the general requirements of the husbandman, the raising of grains and of fruits, and for the pasturage of cattle, the climate I have described is superior.

And here is a coincidence, as Mr. Weller would say: Saginaw valley is blessed with just such a condition. In the latitude comprising this valley there is a mean temperature in January of 22°, and for the entire winter months 20°, for July 71°, and for the entire summer of 70°.

From observations made and recorded throughout the country Dr. Winchell, of the Syracuse University has been enabled to show that the mean temperature of this portion of the State is the uniform temperature of Ohio to a limit of three hundred miles; and that Thunder Bay island is possessed of a mean temperature uniform with that of Peoria, Illinois.

I would refer you in this connection, to the report of President Marston, of the Bay county Agricultural Society, in which it is stated that of fifteen varieties of wheat on exhibition at the fair of 1877, all of them exceeded the statutory weight per bushel, with the exception of one, which fell short only four ounces, while the others were in excess from one to three and a half pounds.

In the matter of oats the excess was still greater, the weights ranging from thirty to forty pounds per bushel.

These are the facts. Our fields yield abundantly of grain and vegetables, and pasturage furnishes the best of feed for stock, with pure water easily obtained. This condition is produced by a salubrious climate, a summer whose sun does not beat through an atmosphere robbed of all moisture, but one whose humid air is continually fed from the bosom of the beneficent lakes. A winter whose coming is delayed until after the harvest is home, and whose severity is ameliorated by the kindly offices of the inland seas on either hand.

SECOND EVENING SESSION.

Hon. Albert Miller, of Bay City, read the following paper on the

PAST AND PROBABLE FUTURE OF THE SAGINAW MARSHES FROM PERSONAL OBSERVATION.

I can convey as correct an impression of the changes that have taken place in the condition of the Saginaw marshes during the last half century, and the efforts that have been made to utilize them, by relating facts and incidents which have come within my knowledge, as by any other method. My personal knowledge of the Saginaw country commenced in the fall of 1831. Then the Saginaw river rolled between well defined banks, and the creeks and bayous were confined within much narrower limits than at the present time; and from observation and information derived from Indians, and others who had previously known the country, I am satisfied that there had been a much lower stage of water in the Saginaw river and bay during the half century next preceding the time above referred to, than there has since that time. At that date there stood on the bank of the river below Carrollton, some very large apple trees that must have had fifty or sixty years' growth, that were destroyed by water more than forty years ago. In the first grove of timber on the prairie which the railroad passes north of East Saginaw there stood a green pine tree two feet in diameter, and much of the timber then growing in that grove was beech, maple, and white oak, all of which has long since disappeared. The grove of timber still further north (which is within the embankment I shall hereafter mention) was called Pine Island on account of the predominance of pine timber. In the early years of my residence at Saginaw the Indians raised corn on Crow Island and on a small island near the junction of the Shiawassee and Tittabawassee rivers, and on other lands known to the present inhabitants as only low and worthless. In 1833, on the 29th day of March, Judge Jewitt, late of Saginaw, and I commenced to plow on Green Point, and with one plow we broke up thirty acres of prairie land, all of which we planted with corn that season. We had no reason to complain of the growth of our crop, but it being the only field in the country it hardly sufficed to feed the millions of black birds that preyed upon it; sometimes darkening the sky in their flight to and from the field. After the corn was in the milk, we spent our time in the field with horns, bells, and guns, in the vain endeavor to protect our crop; in the fall we gathered off the butts of the ears sufficient to fatten forty-seven hundred weight of pork.

The land above referred to was cultivated up to and including the year 1835, since which time a large portion of it has been unfit for cultivation on account of high water. It is impossible for me by any description I can give, to convey to the minds of my hearers an idea of the beautiful appearance that our prairies presented in the summer of 1835. The whole expanse was covered with blue joint grass about four feet high, near the banks of the river being decked with peablossom, morning glory, and other beautiful flowers, presenting to the eyes of those passing up and down the river, or riding on horseback over the firm prairie ground, an enchanting view, which so captivated those from the east who visited our valley that summer, that some of them made large purchases of the land which so delighted them.

It was in the month of June of that year that Dr. Daniel H. Fitzhugh made his first visit to Saginaw, and his name so frequently found on the tract books of the valley will testify to the attractions it had for him. In the summer of 1835, Albert H. Dorr (a member of the then wealthy firm of Tucker & Dorr, of New York city) came west with a view of investing in government lands. On his arrival at Detroit, after looking at the map of Michigan, he determined to locate lands on the Saginaw river. The tract books at the land office showed him several vacant fractions of land on the immediate banks of the river which he purchased, and then came to view his purchases, which he found not valuable, principally lying at the mouth of creeks and bayous. One tract, a fractional section of two hundred acres at the mouth of the river, is now wholly submerged, not a foot of land to be seen, owing to the change that has taken place since the government survey. But nothing daunted, Mr. Dorr purchased other tracts, among which was the land lately improved by Thomas H. McGraw (through diking and pumping) and a tract of eight hundred acres in the vicinity of Crow Island, which latter tract he determined to make immediate use of for a stock farm. At that time the price of cutting and putting up prairie hay was one dollar and fifty cents per ton. Mr. Dorr left one hundred and fifty dollars with parties at Saginaw to pay for putting up hay, and went directly to Ohio to purchase a stock of cattle and horses. Parties at Saginaw with whom Mr. Dorr came in contact, had little faith in his being able to carry out his plans for stocking his farm, and neglected to cause the hay to be put up. When he arrived in the month of November with a stock of one hundred and fifty head of cattle and fifty horses he found no provision made for their winter's food, and being a stranger in the country, with so large an "elephant" on his hands he became somewhat disheartened, greatly desiring to get the whole thing off his hands so he could return to New York. Cold weather had set in early that season, killing the wild grass, leaving very little for stock to subsist upon. After a day or two spent at Saginaw City in the vain endeavor to make some disposition of his stock, Mr. Dorr came to my house at Green Point, on Thanksgiving day, wishing me to take a lease of his farm and stock for ten years. This I consented to do, on conditions proposed by myself, one of which was that I should receive no stock on the lease till after the first of the succeeding May. On Mr. Dorr's departure for New York, the next day, he gave me three hundred dollars to provide food for the stock during the winter, with which I purchased all the hay and grain that was then for sale in the Saginaw valley. This enabled me to keep the stock alive till the ice on the creeks and bayous became sufficiently strong to bear, after which I drove the whole number to the rush beds on the Quonicasee river, ten or twelve miles east of Bay City. Here I erected a log shanty to shelter the men I left in charge, visiting the place myself once a week. The cattle throve nicely and

were in good condition in the spring, some of them having been slaughtered for beef in June. Some of the horses died towards spring from having remain- too long feeding on the green rushes.

In the meantime, I removed my frame house from Green Point, on the ice, to a point at the southern extremity of the grove of timber on the east side of the river opposite Crow Island, a distance of seven miles, and prepared fencing to enclose the prairie, intending to cultivate portions of it, for that year, 1835. All the land between Bay City and Saginaw, except the creeks and bayous, could have been cultivated. Benoit Tromble raised a fine crop of corn and potatoes that year between the grove of timber last referred to and the river, on the present site of the Oneida salt and lumber company's improvements. A heavy body of snow fell during the winter of 1835–6, but it commenced to thaw early, so that in April I broke up some of the prairie preparatory for cropping, and gathered the stock with a view of having it inventoried on the lease. But as the warm weather continued the water arose rapidly, floating away my fencing timber, and on the first of May, when my lease should have commenced there was not an acre of land on the whole tract that was above water. I had previously driven the cattle and horses to the highland to provide for themselves. The water remained high during most of the summer of 1836, and I wrote to Mr. Dorr, describing the situation and requesting to have the lease cancelled, which he consented to, and authorized the stock to be delivered to other parties, to be sold for his benefit. I abandoned the place, and no attempt has since been made to cultivate it. The water rose to a higher stage in 1837 than it attained in 1836, and in 1838 it was higher than I have ever seen it before or since. The low lands were flooded during the whole summer, destroying large tracts of timber, especially a variety of valuable ash timber that skirted the prairies. From 1838 the water gradually receded, till 1850 it was quite low again. In the spring of 1852 it arose to almost the hight it attained in 1838, but did not remain high so long. Before coming west I had heard of a regular periodical rise and fall of the waters in the great lakes. My experience has shown me that there is a great difference in the height of water at different periods, but the periods of the rise and fall are not at all regular.

Before mentioning the improvements made by Mr. Daglish and myself, I will give a brief sketch of the work done by Thomas H. McGraw, of the late firm of John McGraw & Co. He was really the pioneer in improving the Saginaw marshes, by pumping the water from them. Having been relieved from the expense of diking by reason of the main track of the F. & P. M. R. R. and a branch of the same, running to McGraw & Co's. mill. This made an embankment on two sides of a triangle, which encloses a tract of about three hundred and fifty acres of march land, which is bounded on the third side by high land and the mill improvements. In 1877 an attempt was made to pump the water from the inside ditch of the branch railroad, but the work was abandoned on account of a leakage in the bank. It was ascertained that the leakage occurred at a point where edgings had been put into the embankment. Mr. McGraw caused a trench to be cut across the edgings and filled with puddle clay, thus making the embankment secure, when he again commenced pumping in the latter part of July, 1878. He used a screw pump two feet in diameter and thirty feet long, which was worked with power from the engine in the planing mill, with which the water was drawn from the surface of the ground, two hundred and fifty acres of which was covered about four inches deep, and settled in the ditch five or six feet below the surface of the river, in

two weeks' time. Afterwards the ditch filled with water and was emptied by three days' pumping. It is now thought that under any contingency the water can be drawn down by three days' pumping sufficiently low to leave the drain tile, that Mr. McGraw intends to put in, six inches above its surface. A ditch has been dug through the lowest part of the prairie, nine and one-half feet broad at the surface, four feet deep and two hundred rods in length; also one hundred and eighty rods of smaller ditches. In making the ditches, the humus or vegetable matter was thrown on one side, and the marl or lower strata on the other. The last named substance after the ground was plowed was hauled on to the land and dumped in cart-loads, to be spread in the spring for a fertilizer. Mr. McGraw plowed quite a large tract of this prairie land last fall, to be ready for a spring crop. This improvement is prosecuted under the superintendence of Mr. McGraw's father-in-law, Mr. Uberhurst, who is a practical farmer, and a graduate from the Agricultural college of Prussia. He formerly had charge of the stock-feeding department of the Prussian government farm, where six hundred cows were fed, for the sole purpose of ascertaining by experiment, what food for them could be grown and used to the greatest profit. Mr. McGraw has capital to carry out any plan of impro vement he desires to make, and with such practical and scientific knowledge as is possessed by Mr. Uberhurst, to direct the outlay of capital, we may expect to see the model farm of the State, on the Saginaw marshes, and to hear of results from practical operations, that will greatly encourage those who intend improving marsh lands.

In 1860, upon ascertaining that the salt rock underlaid the whole of the Saginaw valley, Mr. Daglish and I anticipated an extensive business in the manufacture of salt. The only methods then known for reducing the brine was by solar evaporation and the old fashioned kettle blocks. Believing that the prairies would be extensively used for evaporating works, and the navigable waters for transportation, we purchased a sufficient quantity of swamp land to secure two miles of the navigable portion of the Cheboyganing creek, with a view of its future use for purposes above referred to; but time developed a cheaper process for making salt than even by solar evaporation, so the idea of using the land for that purpose was abandoned. We never doubted the practicability of improving the land by diking and pumping, but the only data within our knowledge upon which to base an estimate of the expense of diking, was the contract of the Bay City and East Saginaw railroad company with Capt. Smith for grading their track across the low prairie. Capt. Smith was to receive one hundred dollars per day for furnishing and running his dredge, and in prosecuting the work he averaged one hundred lineal feet per day. At that rate the expense would preclude the possibility of a profit on the cost of the improvement, so the matter rested, till 1877, when upon consulting with dredge owners, we ascertained that the work could be done at a price that would give a reasonable prospect for a benefit on the outlay in improving the land. After determining to prosecute the work, we secured the services of Mr. Joseph I. Forcier, through whose practical knowledge of the work of dredging and untiring industry in prosecuting it, our operations have been greatly facilitated. By Mr. Forcier's advice we hired the dredge from the corporation of East Saginaw at the rate of ten dollars for each working day it should be in our possession. After fitting the dredge for work, Mr. Forcier hired his assistants and commenced work on the eleventh day of May, 1878, and during the next ninety-six working days excavated a ditch thirty feet wide, averaging nearly six feet deep, three and a quarter miles long, throwing the earth out-

side, making an embankment of thirty feet wide at the base and five feet high, which has proved effectual in keeping out the water. The depth of water on the land for about two-thirds the length of the line of ditch, was from one to one and a half feet, under which, for the first foot and a half, was a layer of decayed vegetable matter of the color of black snuff, under that was one foot thick of a substance (largely intermixed with decaying shells) which partakes of the properties of the layers directly above and below it. The layer below I supposed was a fine quality of clay for brick-making till I learned from Professor R. C. Kedzie, after he had analyzed a sample of it, that it was marl, containing thirty-six parts of carbonate of lime and sixty-four parts of clay, or a matter that was insoluble in acid, and that it was valuable as a fertilizer of land; and also, that upon a test by burning like other lime, grinding and mixing with sand, it *might* prove valuable as a water lime. No actual test has yet been made of it for any purpose. The ditch and embankment of the south line of our improvement is over one mile in length, running from the creek directly east to the timbered land. In running our ditch back from the creek we found so great a rise in the land we were unable to float our dredge, so we made a dam across the ditch and improvised a pump, by making of plank a box sixteen feet long and ten feet wide, leaving one end open and having a valve in the bottom of the other end; this we balanced across our dam with a hoisting apparatus affixed to the valve end, by which, with horse power, after filling the valve end of the box we raised it, causing the water to flow out of the other end above the dam, which enabled us to keep the dredge afloat, and supply water as fast as the dredge displaced the earth. It was there that we had the first practical demonstration of the sufficiency of our bank to hold water.

We were obliged to throw the earth on each side of our ditch, and after filling it fifteen inches higher than the water in the ditch below, or on the surrounding land, the water settled only one inch during the night while operations were suspended. The earth at that point was as porous as at any other part of our embankment, so we were satisfied that the weight of the bank pressed so hard on the surface of the ground that there was no chance for the water to penetrate it. The land gradually rises from the creek to the timbered land from two to two and a half feet, the lower portion of the land (except where the water was so deep as to prevent the growth of vegetation) is covered with a heavy growth of rushes, reeds and flags, and as the land rises the character of the vegetation changes, first to sour grass, then blue joint, and on portions near the timber there is a growth of buffalo grass and rosin weed. As you pass back from the creek the soil gradually becomes firmer, and the higher portions have the appearance on the surface of being hard clay, but dredging through it has demonstrated the fact that there is a depth of two feet of rich dark clayey soil before coming to the harder substance. There is no part of the tract with a sandy soil except a portion of the grove of timber containing fifteen or twenty acres referred to as formerly having been known as "Pine Island." Our ditch and embankment surrounds on three sides seven hundred and sixty acres of land, about six hundred acres of which is prairie and fit for the plow. On the southeast it connects with our partially cleared thimbered farm of one hundred and sixty acres. In constructing our embankment along the margin of the creek we passed a small bayou in which the water was about three feet deep and the substance below the water was so soft that it was difficult to make a sufficient bank of it; after making an excavation eighteen feet deep

and only raising the bank three feet high we left it to be finished by piling and cribbing for a distance of about seventy-five feet.

The substance taken from the bayou is similar to the middle strata of soil heretofore described, and I think will prove valuable as a fertilizer. After completing our embankment we procured a twelve-horse power steam engine and two of Rumsey's rotary section pumps, one with a discharge pipe of six inches and the other four inches, the two calculated to discharge four thousand gallons per minute. We commenced pumping about the fifteenth of September and run our pumps night and day for six weeks in clearing the water from the surface of our land, and settling it in the ditch, six feet below the surface of the river. That tested the sufficience of our bank to hold back the water; we found no leakage through any part of it. After pumping out the water, as above stated, we commenced a series of ditches through our land all running to the main ditch. From the northwest to the southeast corner we made a ditch four feet wide at the surface, two feet deep and one and a half feet wide at the bottom. This ditch runs nearly parallel with our northeast line, into which all the water coming from the east will flow. From the main or dredge ditch on the west, to the one above mentioned, at an interval of each forty rods, is a ditch three feet wide at the surface and one and one-half feet deep, and one and one-half feet wide on the bottom, making of small ditches six miles. Upon ditching on the lower portion of our land we found it porous, and like a sponge filled with water, but after a few days of drainage through the small ditches it settled and became so firm that a horse could be driven over it without difficulty, and with a small additional outlay for small ditches, we think our drainage sufficient for all practical purposes. No doubt but under-drainage would be beneficial and may be adopted hereafter but there is less necessity for it here than there is for it on much of the uplands. It will be readily seen that the ditch and embankment make an effectual fence for all purposes as far as they go. In addition to the above it will require three miles of fence on the east and northeast to enclose our seven hundred and sixty-acre tract. We have built one comfortable farmhouse on the land, which is all the building yet erected, except an engine house. And as I have been requested to give a detailed account of the character and cost of our improvements,—I suppose for the reason that others who are inclined to undertake a like enterprise may profit by our experience,—I will state that all our expenditure, including the cost of dredging and ditching, the cost of the engine and pump, and the pumping that has been done, also of the house and the estimated cost of a gate and sluice between the ditch and creek, and for completing our embankment, and enclosing the whole with a fence, amounts to a trifle over seven dollars per acre for the seven hundred and sixty acres enclosed and drained.

In setting our pumps we were obliged to raise the discharge pipes so high, in order to keep the belts out of water, that we used about double the power in emptying our ditch than was absolutely necessary. We expect to improve our pumping apparatus so as to clear our ditch the second time in half the time and at half the expense before required. We first intended to have made a ditch and embankment on the east line of our tract to prevent the water from flowing on from the timbered land; but on examining our surroundings we find a heavy ditch passing on our north line, which prevents any flow of water from that direction, and in less than a mile on the east there is another heavy ditch being constructed, which will carry all the water that would flow from that direction south of our embankment; so by pumping the water that falls on a

little larger surface we save the expense of the ditch and bank above referred to. In ordinary seasons, after the spring rains are taken care of, there will be no pumping to do.

Now for our plans and expectations for the future. We think our plans carried out will provide effectually for a thorough drainage, and we have no misgivings as to the quality and productiveness of the soil. After completing our small ditches, we discontinued our pumping, allowing our large ditch again to fill with water. As soon as warm weather commences we intend to start our pumps and empty the ditches before the snow melts. The water flows freely through our small ditches, so we expect to keep it down and have our lands fit for cultivation as soon as the uplands are. With the drainage we have through the small ditches, much of our higher land is fit for cultivation without any pumping. In the spring we intend to commence ploughing on that, and continue our operations as the land becomes dry enough, and put in such crops as shall indicate the greatest profit by production, or in subduing the turf for future cultivation. We do not expect large crops for the first or second year.

Our intentions are to stock down a large portion of it as soon as the soil is in fit condition, to such grasses as will be profitable for stock feeding. On some of the lowest part of our land, which is covered with a heavy growth of reeds and rushes, we shall try the experiment of burning, and harrowing in grass seed without ploughing.

From what I have written of the past and present condition of the Saginaw marshes, it will be seen that they are of very little practical value without further improvement. All the profit that has ever been derived from them is the cutting of a small amount of wild grass for hay, and that practice has been nearly discontinued as the uplands become cleared. But I anticipate a different state of things for the future. I believe that every acre of ground between Bay City and Saginaw is capable of producing the largest crops that can be grown in this latitude. It is now half a century since the Saginaw country first became known to the whites, but the marshes between Bay City and Saginaw present a less pleasing view to the beholder than they did when the eye of the white man first glanced over the broad expanse. But I believe that whoever passes over our thoroughfares between the towns above mentioned fifty years hence, will be presented with far different views. Instead of the unsightly appearance of reeds, rushes, wild grass, and pools of water, the traveller will behold large fields of waving grain, and extensive meadows covered with nutritious grasses for stock feeding, and herds of cattle resting in the shade of groves which dot the landscape, with occasionally a farm house to relieve the eye from the monotony of so much natural beauty.

Judge Marston read the following letter by Hon. James Birney:

MAY THE DRAINAGE SYSTEM OF HOLLAND BE APPLIED TO THE NETHERLANDS OF THE SAGINAW VALLEY.

Holland has a world-wide reputation for having conquered territory from the sea, for having removed lakes, and for having made beautiful and profitable homes for many of her population on ground heretofore waste and only the abode of the inhabitants of the deep. To accomplish this, almost insurmountable obstacles have been encountered and overcome. The larger portion of the eastern side of Holland is below the level of the sea. It is also below the level of the Rhine, as well as of the canals which form the main arteries for drainage. Holland, many centuries ago, was almost covered by the spread-

ing out of the many mouths of the Rhine. The area of water was greater than the area of land. This river, from its source in the glaciers of Rheinwald, flows through gorges of mountains, snow-capped most of the year, along the hills of Germany, conveying the waters of a basin of 65,000 square miles, and is therefore subject to freshets and floods. As it brings down much of the soil of the rich region through which it meanders, it elevates its bed by continuous deposit. Its flow must therefore be restrained by raising its banks and by making permanent levees along its sides. As many of the canals empty into the Rhine, in order to have outlet to the sea, they must be higher than the river, to have flow. The superfluous water that falls upon the country must be raised high enough to be poured into these grand arteries, and thus be taken off. The superfluous water is very large in amount, for the reason that the rainfall in Holland is much more than ordinary. During the year just past there were in Holland only 135 days without rain.

The outflow of the water to the sea is always arrested for a time, when strong winds prevail from the west. For so long as the current of the Rhine, at its mouths, is driven backward, the outward flow is of course stopped, and the canals are full.

The sea is kept back both by natural and artificial embankments. Upon that portion of the coast where the surface is sandy the winds pile the sand up sufficiently to form an absolute barrier to the inroads of the sea. Where the soil of the coast is mucky or alluvial, long artificial mounds of sufficient breadth and height have to be constructed. These are repeated at intervals, so that if the first gives way, the second may withstand the forces beating against it.

For the purposes of drainage, the interior lands are divided into districts, and put under the care of a board whose duty it is to see that everything necessary is attended to at the proper time. A light tax is assessed upon the land in each district, in proportion to the labor that may be expended upon it, in order to meet expenses. This vast enterprise and the maintaining of the system by which it is made a success. has been accomplished by a large expenditure of money and labor. The same population could have acquired in the United States territory enough to have made a state twice the size of Holland for half the money. Harlem lake, near Amsterdam, that a few years ago covered 56,000 acres, has been thrown into the sea, and the same area is now dotted with villages and cultivated in farms, that yield profitable returns, the land selling readily, and for nearly enough to pay the entire expenditure. And the time is not far distant when the Zuyder-Zee, or South Sea, will in the same way be converted into arable land. The drainage of the cultivated land is nearly altogether by open ditches. The rainfall soon finds its way into these and lifted to the main canals by wind mills. When the land is very low it is plowed in ridges so as to give quicker transit for the water.

The *Netherlands*, or low lands bordering on the Saginaw river, are almost the exact counterpart in appearance, of the Netherlands near the mouths of the Rhine. When they are intersected by ditches, and covered with rich green pastures with fat cattle grazing upon them, the one will scarcely be told from the other.

As to their recuperation by drainage, and convertion into tillable lands, the problem is as simple as anything can be. Any portion of them, whether it be 40, 80, 160 acres or a section, when surrounded by ditches, which by some means are kept dry, are redeemed. The earth taken from the ditches, should

be sufficient to make an embankment that will exclude the flow from neighboring lands, from a freshet, or from the back set of the river.

At the lowest corner of the ditches there might be placed a windmill that can be built for less cost than a hundred dollars, which would in a short time clear the ditches of water. It would be thrown up by paddle wheels into an outer ditch communicating with the river. The land would be practically elevated in proportion to the depth of the ditch.

The entire land could be drained at less expense than the same area of timbered land could be cleared and made ready for culture. It would have the advantage of being without stumps, of being on the border of a navigable stream and having under it an inexhaustible bed of salt. Suppose a ditch was made on each section line and of so much width that the earth thrown out would make a good road. It would serve the two useful purposes, of drainage and travel.

As nearly all the Saginaw land is in some slight degree higher than the river, the labor and expense of pumping out would be very slight.

The embankments in the Netherlands here have in large part to be made of sand; the water oozes through. But the clay of the Saginaw land makes such an impervious putty that it would well exclude water.

The process is indeed so simple that it would already have been put into extensive operation in the Saginaw valley, if other lands had not been so easily obtainable. But now, as attention is being more generally turned to agriculture, it is worth the cost to any owner of such land to elevate it by ditches. So soon as the water is removed, and the land changed from a soaked to a dry condition, the sourness will disappear, and it will produce grasses and grains of the first quality.

A sample of the change may be seen in the prairie lands of ex-Senator Chandler, near Lansing, who was induced to buy them and experiment from what he saw during a visit to Hollolland. It may yet be found that the most successful way of dredging the Saginaw river is to raise embankments on either side, and thus by confining its waters increase the force of its current.

Dr. R. C. Kedzie gave a lecture on the "Comparative feeding value of corn and millstuffs." (See lectures given at more than one institute.)

Judge Marston read the following paper on the

IMPORTANCE OF THOROUGHBRED STOCK IN THE DEVELOPMENT OF A NEW COUNTRY.

In presenting my views upon this subject, I wish it distinctly understood at the outset, that I have no personal interests to subserve. I have no stock for sale, and while I may have some partiality for a particular breed, yet I concede they are better for the city than the country, and it will be seen before I conclude that there are other breeds to which I award the palm.

Fancy farming, by professional men, lawyers, doctors, merchants, and manufacturers, is a subject for comment, and affords much amusement to the ordinary practical farmer. He looks upon them as men possessing more of Solomon's gold than of his wisdom, rushing into all sorts of extravagant experiments, spending their money freely in costly farm-buildings, in new varieties of seeds, in fancy stock and in various other ways, from which, in his opinion, no good results can flow, except to demonstrate their folly.

But softly my friends. Are there not two sides to this question? May not these kid glove farmers be doing a very important service, in cultivating a

taste for improvement, in clearing and cultivating the soil, in the improvement of farm buildings, in experimenting with new and costly seeds, in showing the advantages to be derived from drainage, and by introducing new and superior breeds of horses, cattle, sheep, swine, and poultry? Do not these men experiment for the good of their neighbors? Are we not indebted to them for the improvement of horses, in cows, in swine, indeed all our domestic animals, and also for new varieties of fruits and vegetables which have added to man's happiness and very largely to the wealth of the world?

But few farmers in a new country can afford to purchase thoroughbred stock, and while they may possess animals of superior merit, yet they cannot afford to experiment with such, through several generations, in order to develop and establish their superior qualities. Even were they anxious to do this, they could not by the use of some scrub found running on the highways. All intelligent breeders admit that only by the use of some thoroughbred sire, likely to transmit his good qualities to his offspring, can the farmer hope to improve his stock. We are indebted to fancy farmers, who have devoted a life of labor, money, and love to their work, and who as successful breeders have brought our domestic animals up to their present standard of excellence, and to the same class must we look for the introduction of the best types of those animals into this part of the country.

I should be pleased, did time permit, to direct your attention to the importance of agriculture. That, however, has been done by others. At the present time, when our manufacturing interests are not in so prosperous a condition as they were some years since, when the conviction is pretty general that profits in the immediate future are uncertain, should not the claims of agriculture receive more attention at our hands!

One disastrous season, that would close our mills and salt works, would throw at least four thousand people out of employment in this county, nearly all of whom, and many of them with families, are dependent upon their daily labor for support. These men could not find other employment. Think, therefore, for a moment, of the suffering and want which would fall upon hundreds of families in our midst; one-quarter the entire population of our county would be directly affected thereby, and the result would inevitably bring bankruptcy to two-thirds of our manufacturing and business men; houses and stores would become vacant, and every foot of real estate in this city would depreciate fifty per cent. Our manufacturing interests are of very great importance, but we are altogether too dependent upon two branches, really upon one, as the manufacture of salt cannot be successfully carried on apart from the manufacture of lumber.

Let me call your attention to another important fact in this connection. Dr. Kedzie has called your attention to the fertility of our soil. The wheat map of Michigan shows the largest yields to be in the newer counties. We to-day stand where once stood the older counties, in the yield of wheat, and may we not find that as we grow older, the counties still north will in turn out-rank us. It is not the county which to-day possesses the greatest fertility, which will retain its rank as the most productive. Other causes will operate. If we hope to continue to raise forty bushels of wheat per acre, we must return something more than seed to the soil. Land should be tilled, so as to increase rather than diminish its fruitfulness. The yield of wheat must, in great part, depend upon the number of cattle kept. To grow wheat successfully stock must be kept. Upon the one item of manure, unsavory as it may seem to our nostrils, depends our continued large yields of wheat, corn, etc., and thus our agricultural

prosperity. While chemistry will do much in furnishing artificial fertilizers, yet we must rely in the main upon animal manure to keep up the fertility of the soil. Farmers, no matter what the necessity, will not keep animals beyond those required to cultivate the soil and furnish milk and butter for home use, for their manure alone. It is not indirect but direct profits that influence the farmer. If it is profitable to raise colts for the market, he will raise them. If it is profitable to make butter he will keep cows for that purpose. If in doing this his barn yard becomes filled with manure, he will use it. If it is at present unprofitable to raise colts, on account of the low price they bring, or to keep cows because butter is low, or sheep because wool does not bring war prices, or hogs because the corn they eat would bring more in market than the pork when butchered, then I submit it is high time for a new departure.

If the use of a thoroughbred Norman Percheron horse will give us a class suitable for the lumber woods, the farm or the road, horses that will command ready sale at remunerative prices, then why not use him? If the use of a thoroughbred bull with our best native cows will give us superior grades, yielding more milk and butter? If we can raise sheep valuable for mutton, no matter what the price of wool? If instead of the hoop-backed, long-snouted, slab-sided racer, good only to empty the corn crib and squeal for more, we try the improved Essex, the Berkshire, or some of the other excellent and easily fattened pigs, are we not likely to profit thereby?

Let me present a few figures. We have in this county say two thousand horses, valued at $100 each. This would amount to $200,000; at $125 each $250,000; at $150 each $300,000. Here you see $50 added to the value of each horse adds $100,000 to the wealth of the county. If then it will pay a farmer to raise a colt and sell it for $100, will it not pay him much better to raise one that at the same age would find a ready sale at $150?

We have in this county some 2,000 cows. Their average value does not exceed $35, or $70,000 for the lot. Improve this stock, add $10 thereby to the value of each, and you add $20,000 to the wealth of the county. It costs no more to raise a grade calf than a native, yet it is certainly when two years old at least worth $10 more. This is all profit.

I venture the assertion that the 2,000 cows in this county do not average 200 pounds of butter each per year. Yet we have well authenticated instances of cows far exceeding this. In a popular agricultural paper, during the past year, I noticed the record of a Jersey cow which gave 486 pounds in one year, and another which gave 511 pounds, and a young grade Jersey that yielded 300 pounds.

In the Post and Tribune of last week appeared an article taken from the Country Gentleman, giving an account of a visit to a farm in Virginia, and of the Holstein cattle thereon, the property of Judge Fullerton, of New York.

The cow Eva, for three consecutive months, September, October, and November, averaged forty-two quarts of milk per day, and the following five months her average was thirty quarts per day. Her milk was tested and yielded three pounds of butter per day for long periods. I received a catalogue pertaining to the same breed a few days since. I find therein the record of a cow that gave 14,312 pounds of milk a year; this would give an average of nearly twenty quarts per day for each day in the year, and an actual experiment showed 20¼ pounds of milk made one pound of butter, or 706¾ pounds of butter year. Her milk for one year, at five cents per quart, would bring $357.80. A record kept of twelve Holstein cows showed this average yield of butter per year to be 350 pounds. One fact further in their connection. A

farmer in Redford, Wayne county, in this State, who has a herd of Jerseys, sold his butter all last summer in Detroit at 25 cents per pound, and could not supply the demand, while the average price of the best butter was under fifteen cents per pound. How then stands the record:

Native cow, 200 pounds butter per year, at 20c	$40 00
Grade cow, 300 pounds butter per year, at 20c	60 00
Thoroughbred, 350 pounds butter per year, at 20c	70 00
Thoroughbred, 706 pounds butter per year, at 20c	141 35
Or a native cow's butter, 200 pounds, at 15c	30 00
Or a grade cow's butter, 300 pounds, at 25c	75 00

The feed consumed is nearly the same, the care costs no more, the profits are very different.

A writer has declared it to be a "fact well established that the progeny of the thoroughbred and the grade, and of the thoroughbred and the native, show improvements in some respects, as of fattening and milk yield, over both progenitors," while another has said "that 'gilt edge' butter cannot be made from the milk of the native cow any more than good Hamburgh cheese may be made of skimmed milk."

I presume many of you will be slow to believe all this; I certainly do not expect you to raise cows that will reach the highest yield here given, nor is it necessary. What I desire to impress upon your minds is the fact, that with care, and the use of thoroughbred sires you can improve your stock, increase their butter producing qualities and your own profits.

You all value the importance and necessity of using new and improved varieties of seed, why not take the same pains with your stock? Two thousand cows in this county averaging three hundred pounds of butter each per year at twenty cents per pound, would be worth more than double the wheat crop of the county. Yet wheat is considered *the* crop. It would be well to bear in mind, that a farming district may be judged of by its stock as safely as by its wheat fields.

Farmers, in view of these facts, I ask you to take advantage of the opportunities afforded you, to improve your stock. Some of our "fancy farmers" have recently, in horses, brought some Kentucky's best blood into this county. Valuable additions have been made from other counties nearer home, and quite recently an imported Norman Percheron has been added. Thoroughbred Shorthorns, Devons and other breeds of cattle have been brought here, and I hope soon to see the Holsteins.

I fear you will not all take my advice. You will prefer, many of you, to jog along, satisfied to follow in the footsteps of your fathers, believing neither in chemistry as applied to farming, nor in thoroughbred stock.

Bayard Taylor put into the lips of the young man in the "Old Pennsylvania Farmer" these words:

> "If father'd lived, I'd like to know what he would say to these
> New notions of the younger men who farm by chemistries;
> There's different stock and other grades; there's patent plow and cart.
> Five hundred dollars for a bull! it would have broke his heart."

And now, gentlemen, what shall we do? Go on, purchase improved stock and try to educate our farmers up to the point of using it? or shall we consider agriculture beneath our notice and take no interest whatever in the subject?

The French minister of agriculture said, "Agriculture has its rewards for any legitimate ambition; that all parties have an equally powerful interest in it; and that the beauty of the productions of agriculture gives the measure, and in certain respects, the degree of civilization."

Daniel Webster, in an agricultural address, said: "No man in England is so high as to be independent of this great interest; no man so low as not to be affected by its prosperity or decline. The same is true, eminently, emphatically true with us. Agriculture feeds; to a great extent it clothes us. Without it, we should not have manufactures; we should not have commerce. They all stand together like pillars in a cluster, the largest in the center, and that largest is agriculture."

A writer on European agriculture some years since, said: "France has made a greater advance in two short years than we (England) have done in twenty. The emperor is doing much by his personal exertions and example to introduce good live stock and to improve the general system of cultivation."

Why then should we not all take an active interest in the progress and development of our agricultural resources? Our agricultural interests cannot be unduly depressed without injuring all others. The farmers' prosperity means the prosperity of all other pursuits. Every horse of pure blood, every head of thoroughbred stock of any kind brought into this part of the State will aid in the right direction, and will add in a few years thousands of dollars to the wealth of our county.

Why, then, should not men of every trade and profession, as a matter of personal interest and duty, give active aid and encouragement in this direction?

Citizens of the Saginaw valley, let us make a strong and united effort to settle and improve our agricultural lands. With our present railroad facilities, running in all directions; with the prospect of a road being speedily constructed through the Upper Peninsula, thus opening a new and superior market for our surplus products, and connecting us with the great northwest; located upon the great lakes, which afford us the means of cheap transportation, which give us the cool invigorating breeze during the hot summer months, and soften the cold piercing blasts of winter, enabling us to raise fruits that cannot stand a more rigid climate to the south of us; with the supply of pine yet tributary to our mills, our saline deposits, or coal mines in process of development; with a soil rich, fertile, and productive; with our system of common schools, under which none need grow up in ignorance, why should we not take advantage of our superior situation and make an earnest and united effort to at least double the wealth and population of our noble valley during the next decade? To the emigrant seeking a home we offer not alone the above as inducements. We offer him a home in a State second to none in point of intelligence, where law and order prevail, thus affording protection to all in the peaceful enjoyment of their possessions. We offer him a climate subject to no destroying pestilence, and a land free from the locust's plague; where honest toil receives its sure reward in bountiful harvests, which bring remunerative prices; where the sons and daughters of the rich and poor alike may pass from our common to our high schools, and from thence enter our Agricultural College or our State University, and there receive the benefits of a higher education, wisely placed within the reach and means of all. We offer them a home in a State which makes ample provision for the destitute and the unfortunate; where institutions for the deaf, the dumb, and the insane are fostered; and where all may return thanks and render praise to the Almighty without fear of molestation.

May the State ever thus be prosperous and blessed; may we, each and all, to the extent of our several ability, assist in bringing this our beautiful valley up to that standard of excellence, not alone in agriculture, but in all the various pursuits, which united, insure the highest degree of prosperity and happiness to mankind.

The committee on resolutions, by their chairman, Hon. A. McDonell, presented the following, which were unanimously adopted by a vote of the audience:

Resolved, That the people of Bay county hereby acknowledge the great services that the State Board of Agriculture have conferred upon us by appointing the institute just closed; and

Resolved, That the thanks of this community are hereby tendered to President Abbot, Professors Kedzie and Carpenter, and Secretary Baird, of the State Agricultural College, and our friends beyond the limits of our county, for their very successful efforts in making the Northeastern Michigan Farmers' Institute a success.

President Abbot very happily replied to the tender of thanks, and then Judge Marston formally declared the institute closed.

DOWAGIAC INSTITUTE.

This Institute was held commencing on the evening of January 28th.

Notwithstanding an exceedingly unfavorable condition of roads the attendance was large. Young Men's Hall, in which the sessions of this Institute were held, was well filled.

Quite a number of farmers were present from Van Buren county, among whom were Hon. J. J. Woodman, David Woodman, jr., J. R. Hendryx, H. J. Hendryx, Mr. Durkee, and A. C. Glidden. There were also some from Berrien county, whose names we are unable to give. Mr. R. F. Johnstone, of the Michigan Farmer, was also present. The attendance of these gentlemen added much to the interest of the meeting. They are just about such a delegation as we would like to have devote two or three weeks every winter to attending these Farmers' Institutes.

Hon. W. G. Beckwith, President of the Institute, called the meeting to order, and in a brief and appropriate address of welcome, strongly urged the necessity of better organization of farmers. Farmers' Clubs, Granges, Institutes, etc., were all of great advantage. He described the old system of schools, especially schools in which farmers' sons were educated, and contrasted them with our present Agricultural College. He put considerable stress on the necessity of farmers being educated to their special calling.

Prof. R. C. Kedzie gave a lecture on the "Capabilities of Northern Michigan." (See lectures given at more than one Institute.)

Henry B. Wells followed with an essay on the

MANAGEMENT OF SWINE.

He was of the opinion that swine were the most profitable stock to the farmers of southwestern Michigan, notwithstanding the depression in prices of the last year or two. He deprecated the use of dogs, especially if managed by small boys. In his opinion the small boned dark colored varieties were best suited to our purposes. In winter he feeds clover hay, roots and corn. Never keeps what are usually termed breeding sows, but breeds once and turns off the same year. Sows before farrowing should be separated at least a week, that

they may become accustomed to their quarters and should not be disturbed, unless very quiet, until two or three days after the young have come. He recommended chaircoal and soap for scours. Pigs while young, should be fed on slops made from mill feed His main dependence in summer is clover, but at the same time feeds some corn. Furnishes warm sheds and good beds in winter, but does not think best to confine them too closely. Good clean water he also regards as important. Feeds in summer liberally of charcoal, ashes and salt, and when fattening for market adds copperas. Practices "hogging down" corn in the fall, and believes it to be a good and economical practice; hogs do well and it saves labor. To fatten hogs in cold weather he would feed cooked food once a day at least.

At the close of the essay a lively discussion followed on the subject.

H. J. Hendryx asked, why not feed roots in cold weather, stating that they had fed them during the recent cold weather successfully.

F. D. Gully, of the Agricultural College, said they wintered hogs almost exclusively on beets, but does not think cooking pays for anything but potatoes.

Mr. Wells, in answer to a question, said he thought the cause of hog disease was the want of coal and ashes. When the country was new, these were plenty from natural sources, but as the country gets older, these must be supplied.

Capt. Hendryx said for years they had kept salt and ashes before their hogs all the time, and before their horses and cattle as well.

B. Hathaway keeps lime before his hogs, was led to do so from seeing his hogs eat old plaster.

J. A. Lee said he had traveled over the three southwest counties, and found that there was about as many theories in regard to the hog disease as there are farmers, and none of them knew anything about it.

Elias Morris took no stock in the ash theory,—the prairie land had no ashes originally.

D. Woodman, 2d, practices "hogging down" and believes in it, saves labor and leaves land in good condition.

The President, Mr. Beckwith, said he had observed symptoms of the disease among his swine, uses as a preventive and corrective, sulphur, copperas and ginger, which he puts in swill. He thinks hogs along streams much more liable to the disease than on inland farms.

Mr. Osborn, of Van Buren, controverted the idea that hogs having access to a running stream would be more liable to the disease on that account.

Mr. Barber, of Edwardsburg, keeps ashes, copperas and sulphur in a trough under a shed, where his hogs can have access to it. Never lost any until this year,—have now lost 125. Thinks Berkshires the healthiest.

Mr. A. Fiero thought the disease was contagious and traveled like the epizootic.

Mr. B. Hathaway, of Little Prairie Ronde, read the following essay on

LONG KEEPING APPLES.

The varieties properly comprised in this list are those mainly to be relied on for profit in the present state of our pomological experience and knowledge.

In naming the few sorts that I feel safe to include under this head I shall not attempt to put them in the order of their value, for the ratio of their value is not fixed. One variety will be found most profitable in one portion of the State, or county, or township, and another variety taking precedence in other localities, though perhaps in the immediate neighborhood. The next that can be done will be to point out the peculiar characteristics of each, and the loca-

tion and character of soil best suited to insure its success; in other words, to enable men having a certain soil and location to know what to plant.

While it is evident that the number of varieties of apples grown in the State have largely increased in the last few years, both by the introduction of kinds from other States and from Europe, it must, nevertheless, be conceded that those an experienced fruit grower would plant, or recommend to plant, with a reasonable expectation of realizing profitable returns in fruit, are decreasing year by year.

The demands of the market, by calling more and more loudly for certain kinds, have worked a very marked change already in the apple orchards of the State.

The failure of old and aforetime popular sorts to be longer productive, and the tenderness of others when submitted to the vicissitudes of our climate, have further tended to lessen the kinds that the observing and intelligent orchardist can plant with any degree of confidence. And it is at least probable, judging from the past, that the apples we now grow most successfully, will be superseded by new, and now unknown varieties, within the lifetime of men now living.

The Baldwin.

If the number of trees of this variety planted throughout the State, or the proportion of trees in old orchards grafted to this sort, or the preference of buyers in the fall for this fruit were to be taken as conclusive evidence of its value, it would of right stand first on the list.

That it is one of the most productive kinds, where it is successful, is conceded. That it is a good shipping apple, though not the best, is also unquestioned. The quality, while it is good, and suits many tastes, cannot compare with that of others on the same list.

The chief drawback in planting it, at least in this part of the State, is the risk arising from the tenderness of the tree, thousands of trees having been killed in both orchard and nursery by our hard winters, in all, or nearly all, portions of the State.

It seems to be more hardy north than south, the southern tier of counties in this State being about the limit of the successful cultivation of this variety. Even in this county it should be planted only on high grounds, and the more hilly and stony the better. If grown at all on comparatively low, retentive or heavy soils, it should be top-grafted on some entirely hardy stock, like the Northern Spy, or Dutchess of Oldenburg.

The tendency it sometimes shows of dropping prematurely, is a fault that is common to many of our best apples; and it should be gathered on this account as soon as possible after it is properly ripened.

Generally a very large proportion of the fruit is marketable, even on neglected orchards, which seems to offer a premium, especially to careless cultivators, on planting this variety.

The Northern Spy.

In spite of the past season's experience with this variety, which was exceptional, there being so large a proportion of the fruit unsalable, I feel constrained to place it on the list of long-keeping valuable varieties. In quality, there is nothing superior to it, when well grown, being far better than the Baldwin, while in productiveness, with me, it fully equals if it does not surpass that variety.

The tree is entirely hardy on any ground where an apple tree should be planted in this State. It is a little slow, it is true, in coming into bearing, but it amply repays all delay, when the bearing habit is once established. It has also the advantage of the Baldwin in this, that it is not so likely to bear only alternate years, giving often two or three crops in succession, before tak-a rest.

The tree has the virtue of holding on to the fruit, however heavy the crop, until you are ready to pick it, which is no small merit.

The faults of this variety are, unless the trees are properly pruned and cared for, there is a liability that a large proportion of the crop will be unsalable.

Buyers do not like it so well as some others, especially in the fall, as it does not hold so well after shipping as those of tougher skin and less delicate texture.

It is thought by some not to be a good keeper, but when well grown and submitted to the proper conditions it keeps well. It should not, however, be barrelled if to be held for the spring market, but be put in crates holding two-and-a-half bushels, and stored in a cold dry cellar devoted to fruit alone.

When properly handled it will sell in the spring for more than the Baldwin. I think it on the whole, one of the really valuable sorts, at least for the enterprising cultivator.

The Red Canada.

This variety has a growing reputation in all parts of the State. Although but recently introduced into western Michigan, it has been grown in the eastern counties for a long time, and is still counted second to none, as a valuable and reliable sort.

As a keeper, it is superior to the Northern Spy, Baldwin or Golden Russet, and is eagerly sought after by buyers, where it is known. While it will not compare with the Spy or Baldwin, perhaps, in productiveness, its general fairness and unsurpassed keeping qualities, together with the hardiness of the tree, and the popularity of the fruit in market make it one of the really valuable sorts.

One reason why it has not been more generally planted is the fact that the tree is a slow grower in the nursery, taking four years to attain the size of a Baldwin at two; consequently nurserymen dislike to grow it at the price of other trees, and only those who know its value care to buy it. It makes a fair sized, healthy tree in the orchard, not having been winter-killed by our severest winters, so far as I know.

On account of its rather weak habit, it is better top-grafted on some strong, hardy variety, like the Northern Spy. Grown in this way it makes a tree of more vigor than if grown as a root graft, has a more beautiful shape, and gives good crops of fair fruit.

This plan of grafting on uniform, hardy, and vigorous stocks, such of our valuable varieties of apples as have a weak habit, or that are a little tender, is beginning to attract the attention of planters.

In the last few years I have had quite a number of orders for Northern Spy, one hundred, two hundred, and more, for this purpose, from men who both study and observe, rather than accept the stereotyped ideas of the pomological writers of fifty years ago. These are the exceptions, however, the majority of men preferring to take the chances of a tree on its own roots, however weak, rather than pay five cents extra for one reworked on a vigorous stock.

The Wagener.

This apple has had a run of popularity in all parts of the State, nearly equal to, and in sections surpassing that of the Baldwin. Although experience has somewhat lessened the confidence of growers, it has characteristics of both fruit and tree, that will commend it to the attention of planters in spite of its defects.

As a nursery tree it is unsurpassed in vigor and beauty; and this is one reason why it has been pushed into notice so persistently, often beyond its deserts. Nursery men like to grow it, and men who go to the nursery and choose trees by the eye are sure to buy it.

In early productiveness there is nothing in all the list that will compare with it. It is only necessary to get it well established, and it begins to bear at once, not a few specimens, but a full crop for the size of the tree. Even from nursery rows of only three or four years' growth, the fruit will often pay for the gathering.

It will not hold like the Baldwin, but keeps fairly, and sells at about the same price. It has a thin skin and tender flesh, consequently, like the Spy, it requires careful handling, and like that variety, keeps better in open crates than in tight barrels, where a large quantity is to be stored for the spring market.

For its early productiveness, however, which is one of its chief recommendations, something has to be discounted from its ultimate value.

The habit of bearing at an early age is so persistent that the trees become permanently dwarfed, or so much so that at fifteen years, when the Baldwin will be producing four or five barrels, or more, the Wagener will give only half as much. And it is reasonable to suppose, and here we have not demonstrated the fact from experience, that the longevity of the tree must be impaired. It must be conceded also, that quite often a large proportion of the crops is defective, and that it is rather inclined to fall prematurely. Still where a man has no fruit, as in the newer parts of the State, it is no doubt the best of economy to plant it quite largely.

Golden Russet.

This sort, while not so generally successful as it is a hundred miles or so north, has some claims to attention. The tree is as hardy apparently as the crab-apple, and is more to be relied on for a partial crop in seasons of general failure than any of the foregoing, except the Spy.

The fruit is usually fair, but rather subject to the attacks of the apple worm; and it does not keep, grown here, as it does grown farther north. It sells well late in the spring, when other sorts are out of market, but buyers do not call for it in the fall as for some others.

While it is probably one of the best for the latitude of Grand Traverse, it cannot be recommended to be planted in the southern part of the State as freely as some other kinds. It is not as large as the Roxbury Russet, nor is it as good a keeper. But the tree of the latter is tender here, while that of the Golden Russet is hardy. All things considered, it is probably the most valuable of the russet family for the west.

There are a few other kinds that may perhaps, after further trial, be added to this list, that are grown to some extent in this part of the State. Among these I will mention the Jonathan. This is a beautiful apple, though rather small. It is a good keeper, the tree a free bearer, and entirely hardy.

The Stark, also, though but recently introduced, promises, from its hardiness, productiveness, fair size, and long keeping qualities, to be an acquisition. But it is too soon, however, to speak with confidence of its value.

While the above are the only varieties of long keeping shipping apples that, from my somewhat protracted experience, I feel safe to recommend for planting largely in this part of the State, many will be surprised, perhaps, that the list is so short, that I do not include such a variety as the Rhode Island Greening, an apple that has stood for half a century, or more, at the head of this list, in the best apple-growing regions of the east, and that in many parts of the west is still held to be one of the profitable sorts to plant for market purposes.

My answer is, with me it will not bear one-fifth as much as either of the foregoing, and I believe that my experience is the experience of nearly all planters in southern or southwestern Michigan.

That it is a valuable sort, a degree or two further north, is more than probable, but here it must be given up, except possibly in some few favored localities, as a standard sort for the market.

It will continue to be grown as an amateur fruit and for family use, and this leads me to say a word or two in regard to the needs of a family orchard. While it should include all the above, it should take in a good many others also, whose chief value is culinary, and æsthetic rather than commercial and pecuniary.

It would make this paper too long for this occasion to attempt even the most select list to cover the whole season for a family orchard. This branch of my subject is ample for a long essay, and well worthy of one.

FORENOON SESSION.

Mr. F. A. Gulley, foreman of the Horticultural Department at the Agricultural College, gave the following address, on

IMPLEMENTS FOR THE FARM AND GARDEN.

Those of you who attended the State Fair, held at Detroit last fall, were probably surprised and pleased to see such an immense display of agricultural machinery. There were machines for doing the work in all that pertains to the farm or garden, and some of them made at great expense, and so elaborate that they might be classed with works of art. You, perhaps, may have felt as I did, proud to think our country had produced so many implements to help the farmer. But did it occur to you, who furnished the means to build all those machines, who supported all those agents who endeavored to impress upon you the superiority of their particular machine over all others of its kind, did you remember that the farmers have to foot the entire bill?

In the statistics of Michigan for 1870, the cash valuation of farm implements and machinery in this State, is given as $13,500,000, an average of about $120 for each farm in the State.

The cash value of all the implements is not more than one-half of the original cost, making the capital invested in them, at least $27,000,000. The interest on this amount, at seven per cent per annum, is equal to $1,890,000.

If we take into consideration the breakage, cost of repairs, and wearing out,

we replenish our stock of implements at least once in seven years. In other words, it costs one-seventh of $27,000,000, or $3,850,000 to replace and repair broken and worn out implements. Adding to this amount the interest on the cost or capital invested, as previously given, we find the farmers of the State are expending $5,740,000 for implements each year. Deducting the school tax, this amount is equal to, if not greater, than the total yearly taxes on farm property.

Again, if we take the average amount of time that farm tools and implements are used, it will be less than one-fifteenth of the year, or twenty days. Not many mowers, reapers, grain-drills or cultivators are used fifteen entire days during the season, One of the tools most in use, the plow, running twenty-five days, would turn over from forty to fifty acres, and where land cropped exceeds this amount on a farm, there will usually be found more than one plow.

We find, therefore, we are paying over five and a half millions of dollars annually for implements to use not more than one-fifteenth of the year.

I do not advocate farming by hand labor, for to make it profitable, and at all agreeable, we must use the best labor-saving machinery. We can't go back to the sickle and the scythe, and live as intelligent men should, nor could we supply foreign markets with agricultural products, thereby securing a portion of their wealth, and making our future prosperity a certainty.

Our country has just commenced to do business in a way that must prove successful, whether carried on by an individual, a company, or a nation. We are selling more than we are buying. The balance or foreign trade is in our favor. The greater portion of our exports are produced by our farmers, and to keep up this great export trade we must raise large quantities of meat, grain and other farm products, and be able to deliver them in the markets of the world at a lower price than they can be furnished by any one else. We must produce them cheaply, or competition will drive us out of the market, and we will lose the trade. To do this we shall be obliged to do the greater part of our work with machinery.

The question for us to study is how to use machinery to make it pay.

A writer in the Scientific Farmer, of last September, gives a list of the implements he finds it necessary to have to carry on one of the small New England farms economically, and their cost is over $1,000.

But how can the man with but from forty to eighty acres of land afford to buy all this machinery? How can he compete with him who has from one to five hundred acres? To grow the same crops as cheaply he must use the same machinery. But, the small amount of his crops will not warrant so large a capital invested in implements, to be used only a few days in the year.

This is a problem that has awakened much interest, for it is a well known fact, that in manufacturing, large amounts of any article can be produced cheaper in proportion than small amounts.

It is even thought by some, that in time, the large farms will absorb the small ones, just as we see extensive firms in other kinds of business, by their better facilities undersell and drive out the small firms, and monopolize their trade. There may be some danger ahead for small farmers from this cause, for a bushel of wheat or corn can undoubtedly be produced for less money where a hundred acres are grown, other things being equal, than where only ten are raised. But to my mind the only great advantage the large farmer has over the small farmer, is that he can afford to use more and better implements, and use them to better advantage by having longer fields to work in.

Farming, unlike most other kinds of business, can in many things be carriep on in a small way more economically than when on a large scale. In other pursuits, where skill is necessary, we find trained workmen, as the carpenter, mason or machinist, in the manufactory, mill, or mine, and the work always gives evidence of the ability of the workman, and the amount he does. The employer can hire men to do his work and have it done as well or better than he can do it himself. But on the farm, where the labor is even more intricate, we get as a rule almost totally unskilled workmen.

A farmer who understands his business cannot hire a man who will drive his team as he can drive it, or plant as he can plant, or feed his stock as he can feed it.

Men who are skilled in the different operations of the farm, and faithful in their performance, are seldom found in the position of employés. There are jobs to be done nearly every day that the ordinary hired man will half-do, and the farmer will not know it. He can't tell how an animal is fed, or how a horse is driven, or whether seed is put in right or not, unless he can see all the work while it is being done. As an argument in favor of small or medium sized farms, I would call your attention to the fact, that while it is not uncommon to find in any of our cities men with a capital of $100,000 or more engaged in business of various kinds, we do not often find men with half that capital invested in farming. Yet statistics show that in proportion to the whole number, more men who have commenced with little or no capital have been moderately successful as farmers, than have been successful in other business.

I believe the greatest success in farming will be attained when farmers, as a rule, will have less than one hundred acres of land, and when the great mass of workmen in the soil will be land owners, instead of hired workmen, and when by the use of machinery they will never need more than one or two hired men, and farmers' wives and daughters have time for something more than cooking and washing for the hired help.

But to succeed we will be obliged to a great extent to use the same machinery to cultivate our small farms, that is used on our large farms. Without claiming to offer anything new on the subject, I will endeavor to point out some of the ways by which this may be accomplished.

We must not buy any tool we do not actually need, or one that the expense of working would be more than the labor saved is worth, or one we will not use after we get it. I doubt if there is a farmer present who has not at least one implement lying around that has not been worth to him one-half of its cost.

I have seldom gone into a farmer's barn without seeing a feed-cutter in some back corner; yet how few are used? Cutting feed is a good deal like composting and turning over manure, it works well scientifically and theoretically, but practically, it will not always pay for the extra labor. When material is cheap and labor dear, I doubt if either will pay in ordinary farming.

It will, probably, pay to cut up rough fodder, when done on a large enough scale to use some kind of power. But taking the whole State, I don't believe there is enough saved or made to pay seven per cent on the cost of all the machines.

It certainly will not pay to buy these implements for hen-roosts, the purpose for which they are so commonly used.

Nearly every farmer raises more or less of the small grains; corn, hay and potatoes. To grow these crops economically, he must use a grain-drill, reaper,

mower, horse-rake, one two-horse, and one one-horse cultivator, shovel plow, roller, harrow, sod and stubble plow and fanning-mill, besides some smaller tools. If he raises clover, as every farmer should, and roots, he will also need a hay-tedder, seed-drill and root cultivator.

These are all expensive tools, and if he has but fifty or sixty acres under cultivation, the interest on their cost and repairs would nearly, if not quite equal the profit on his crop; yet to compete with the man on a large farm, he cannot dispense with them.

It is not necessary that to have these implements to use, each farmer should own all of them, any more than it is he should own a threshing machine to do his threshing. Let two or more men own these machines together, or each own one or more, and exchange one with another. A grain drill can as well be used by three or four farmers, and sow one hundred acres or more every year, as forty acres, and the same with the other tools.

I am well aware that there are objections to this plan of exchanging tools, but having to some extent given the plan a trial, I believe it practicable.

There would of course be some loss of time in changing from one farm to another. There would also occur times when more than one would want the tool at the same time; but some soils are earlier or later than others, both in seed time and in harvest, and by a little systematic arrangement and good feeling, the latter objection could be met. When the places are near together, in very busy seasons, one man could, by starting early in the morning, use an implement seven or eight hours before noon, and another the same time in the afternoon.

I found I could better afford to be at some inconvenience, than not use an implement which I could not afford to own. It might be best in the case of mowers and reapers, as they require careful and skillful handling, to let one man own and use them, and pay him by the acre for his work.

One of the most difficult matters to arrange would be for the difference in wear, on rough and smooth ground. The remedy would be to oblige each man to put his fields in good shape or not use the machine.

Care of Tools.

In traveling around the State some, this winter, it was a common sight to see a wagon, mower, plow, or other implement being wintered out of doors, not for want of room, but through carelessness.

Farmers generally know, or ought to know, that an implement of any kind, is injured more by being left out over winter, than it would be by careful usage, and shelter when not in use during the summer.

The man who leaves tools exposed carelessly, is the one who forgets to use oil on the wearing parts, to tighten up nuts, and look after small repairs generally. He has heavy bills at the shop for costly breaks.

We have at home a set of bob-sleighs that have been in use twenty-three years, except new shoes and an occasional coat of paint, they have had scarcely any repairs, and are still sound. A neighbor who cannot find time to put his sleighs under shelter, is using his third pair in the same length of time.

Another neighbor has commenced with his third mowing machine within nine years, while I saw another who had just put new sections on a mower he had used ten years, cutting more grass each year than the first, and he told me his machine ran almost as well as ever. He took good care of it when in use, and kept it in the barn when not. The first did just the reverse.

Painting Tools.

It may not pay to paint a barn, except for the improved appearance, but it will pay well to keep every implement on the farm well painted. An occasional coat of paint will almost double the length of time an implement made partly of wood will last. It requires little skill, as paints can be bought already mixed, and ready to apply. Any farmer boy can paint a sleigh or wagon, and after a little practice, and with a little advice from any painter, he can paint and varnish a buggy, and for all practical purposes do almost as good a job as they do in the shops, leaving off, of course, the striping, which to my taste, adds no more to the beauty of a vehicle, than would stripes around the body add to the appearance of a horse. Hoes, rakes, shovels and other small tools should have a coat of paint every year, as they are often left out doors, and the paint would keep the handles from getting brash, and liable to break easily. I would paint all the small tools a bright red, it gives them a neat appearance, the color will not fade or soil easily, and being such a showy color, a hoe or shovel can be seen across the field when accidentally forgotten. Who has not hunted half an hour for a hammer, or other small tool, and find it at last right where he suppose he had looked a half dozen times, when had it been painted a bright red, it would have been the first thing the eye would have seen.

I have known of a mowing machine cutting fifty acres of grass in one season without any breaks, and scarcely any apparent wear, and of another equally as good at the beginning, sent to the shop for repairs that cost ten dollars, before ten acres were cut. The first was used on clean, smooth soil; the other on an uneven field, with bushes and grubs scattered here and there. With the same usage the first machine was good for more than ten years; the latter for not more than three.

Said a farmer, I like the two-horse cultivators, they do good work, but I use one all up in two years, as my land is a little rough; I can hardly afford to pay out so much cultivating.

Men who will work land year after year, that is so rough that it won't pay to use machinery on it, had better take Horace Greeley's advice, and "go west," and get a prairie farm. They may half starve along, and by the rise in value of their land, caused by their neighbor's improvements, finally come out ahead, but they cannot make anything raising crops on such land at present prices. I have known as much loss from breaking of implements on stones and roots in a field in one year, as would pay for putting the field in permanent good condition.

There are farmers all over the State with large farms, who barely make a living because it takes all the profits on the better portion of the farm to make up for the loss on the poorer part.

If a farm is rough and uneven, it will pay better to clean up a portion of it, make it smooth, so that implements can be safely used, give it all the manure made, and all the work, and have a good crop on that part, than to have a half-crop on the whole.

The wheat crop of this county for the last two years, averaged a fraction over twelve bushels to the acre (54,903 acres, 667,071 bushels). The total amount of the wheat could have been raised on one-half of the land, had it been under a good state of cultivation, and for a little more than half the expense.

Many farmers subject themselves to great expense by often changing the style or general character of their farming. For a year or two nearly the

whole farm will be in grain. A grain drill and reaper are bought. Then wheat becomes cheap, and grass and corn take its place. A new set of implements are required, and the drill and reaper lie idle. The next move may be cows, sheep, or pigs, requiring another outlay, and another set of tools are laid by.

Mixed husbandry, that is, raising some stock, some grain, etc., with some rotation and one or two leading crops, according to soil, location, and market, will, as a rule, prove the most profitable. The aim should be to adopt one line of farming and stick to it, thereby avoiding the changing of implements, or having tools that would not be used.

Buying Tools.

The work for the summer should be planned during the winter, and if any tools are needed then is the time to decide what to get. If a mower is required it is a poor plan to wait till the grass is ready to cut, and then go to an agent and take his advice in regard to the kind of machine to get.

If a man has never used a mower let him go to some farmer, who has one, and ask him to point out its weak parts, and find where it has been broken, and how, notice where the most wear is, ask if it runs easy, and is convenient to handle. Let him find out all the owner knows about the machine, and how he would have it changed, if he could; and then go to some man who has a mower of a different make, and find out all he can about that. Let him examine all the mowing machines he can find time to, and get all the information he can from their owners, paying especial attention to the weak points, and considering where and why one machine is better than another.

A little spare time in the winter spent in this way will give a man a pretty good idea of what a mowing machine should be, and he won't have to rely upon the statements of showy circulars or smooth-tongued agents for information as to what to buy.

If farmers would only consult each other before buying any implement, and find what others have learned by practical experience, there would not be so many thousands of dollars wasted on poor and worthless implements.

We have in the college, in the museum, a lot of models sent from the patent office, at Washington, and among the lot are, perhaps, a hundred models of cultivators, plows, and harrows, of which not more than ten are of any practical value, and I could find but one in the whole lot that I would consider worth buying, to use.

There are thousands of farm implements made and sold every year that are worth little or nothing to the farmer. Some are made merely to sell, and some because the manufacturer does not know what is required. While we have great sympathy for the innocent and honest farmer, who has given his hard earned dollars for a worthless implement or patent-right swindle, yet we can't forget that "it takes two to make a bargain." We may always expect that there will be rogues to sell just so long as there are men foolish enough to buy.

The "grange" has done a good work for the farmer, in bringing the producer and consumer nearer together. The agent does not get one-half of the price paid for implements as he did formerly. Still there is too great a difference between the actual cost of making farm implements and the price the farmer pays for them. We must have them cheaper.

The next work for the "grange" and farmer's club, is to study what to buy, and how to use them. What we need is not more, but better implements. We must buy only those that are adapted to the work, and made to last, and do

more work with them. Whatever the size of the farm, have as few fences as possible, and make room for machinery.

There are several implements I wish to speak of, that having used, I can recommend highly, and the first is the field roller. I believe it will pay to use it on all farm crops. Gardeners consider it necessary that the soil should be pressed down firm around seed of all kinds when planted, as the seed will make a better start. Hand seed-drills without a roller, ought never to be used, unless the land is to be rolled afterward.

Light soils are better for being packed down fine, and on hard or heavy soils the roller breaks up the lumps, and makes a better seed bed; but it should never be used while the soil is wet. I would harrow and roll winter wheat and rye in the spring, especially if seeding with clover, and roll spring grain after sowing, as it not only packs the soil among the seed, making it germinate better, but breaks up the lumps and leaves the land in better shape for the reaper, mower and horse rake.

I would roll corn and potatoes after planting to pack the soil around the seed so that the plant would not be easily moved, and run a light harrow over them as soon as they come up, and again before the plants are four inches high, this would kill the first crop of weeds, and loosen up the soil so that the corn or potatoes would grow rapidly, and with careful cultivating, hoeing may be dispensed with altogether.

One of the best implements to use on crops both before and after they come up, is the Thomas smoothing harrow. The teeth are made of round steel drawn to a point and slant back. It may be run over corn, potatoes and grain after they come up if the soil is not too loose and uneven. It loosens up the surface, causing the plant to grow more rapidly and destroys the first crop of weeds. The only objection to this implement is its price, which is too high.

DISCUSSION.

Captain Hendryx said that although it was the penalty that man should earn his bread by the sweat of his brow, he believed it was every man's privilege to get the most bread possible with the smallest expenditure of sweat. In order to do this it was necessary to have the best of implements. That was not always best that cost the most. The farmer himself could construct at a very trifling cost, some very useful implements. He believed in sometimes cutting feed, but he did not find any advantage in using an expensive cutter. He used one that a farmer might make in a day and he preferred it to some much more expensive.

Mr. Hathaway, and others, spoke of the marker exhibited by Mr. Gulley.

Mr. Durkee said that farmers frequently, not being good judges of the adaptability of machines, spent many thousands of dollars on implements that were not suited to their purpose. Different soils require different styles of implements, and it was necessary to understand what was suited to our individual wants. Some of the more expensive machines used on the farm, he thought it was better for most farmers to hire than to own them.

Widely different opinions were expressed in regard to the value of the Thomas harrow. Messrs Gage and Morris did not like it. J. J. Woodman thought it one of the best harrows ever used. A number of farmers spoke very highly of the spring-toothed harrow.

Hon. J. J. Woodman said: I have been very much interested in this discussion on farm implements. The improvement that has been made in farm implements is a triumph of brains over brute force. During my visit to Eu-

rope during the past year, I found that there they are far in advance of us, but in regard to farm implements and machinery we are far in advance of them. In France, I have no doubt, there are more farms than plows,—in many places grain is still cut with a sickle, and women work with the men in the harvest field.

A joint ownership of the more expensive implements has been alluded to in this discussion. I own a half-interest in a plaster-sower which has proved an excellent investment. It is one of the most useful and labor-saving implements we have. It costs about forty dollars and one would do the work of a whole neighborhood.

The implement referred to was made at Dowagiac.

Mr. H. J. Hendryx read an excellent paper on "Horses," which we exceedingly regret not being able to publish, as we have not the manuscript.

DISCUSSION.

J. J. Woodman.—I would like to have Mr. Hendryx state the reason why he would not use a graded sire in breeding.

Mr. Hendryx.—I would use only a pure-blooded sire, because with any other you cannot be sure of what you will get. The grades will breed back and you will not be likely to get such a horse from them as you expect or want.

Mr. Durkee.—I think farmers lose more money from not understanding the science of breeding than from almost anything else. Mr. Hendryx is entirely correct in regard to the principle of breeding only from a pure-blooded male, and the purer the blood of the dam the better.

Mr. John Hain gave a brief extempore address on "Wheat," with which the forenoon session closed.

AFTERNOON SESSION.

Dr. R. C. Kedzie gave his lecture on "The Comparative Feeding Value of the Different Kinds of Indian Corn and Mill Stuff."

[See lectures given at more than one Institute.]

Hon. Milton J. Gard read the following essay on

CORN AND ITS CULTURE.

The corn crop is one of the most important that is raised by the farmers of Cass county. Its importance is so well understood by all thinking farmers that I deem its discussion at this time unnecessary. Although it is not the crop relied on by farmers for turning into ready money, it at the same time is the basis for nearly all the operations of the farm, and my impression is that indirectly there is more money in it than in any other crop raised on the farm. My impression is that a general failure of the corn crop in this county would be a greater calamity to the farmers than the loss of any other single crop. There is no other crop that would fill its place, when its feeding value is considered. The stalks have a high feeding value when properly saved; I think equal to good hay and very much cheaper. The corn crop is the main dependence for wintering our farm stock, the feed for our teams, fattening of our swine, beef and mutton, production of our wool crop, milk, butter and cheese, and is extensively used for human food. Among our most happy re-

flections is the memory of the bowl of mush and milk and the golden corn-dodger.

One of the first things attended to by the pioneers of Cass county was to get in a patch of corn; it was food for the family, and winter forage for the stock.

In a proper rotation of crops the corn should have a conspicuous part, and in fact it is indispensable for the purpose of cleaning the land of foul stuff. There is no other crop that will so thoroughly and so cheaply clean the land from sorrel, thistles, cockle and chess, as the cultivation of corn. Two succeeding corn crops will clean the worst infested fields. Wherever you find a successful corn raiser you will find a good farmer. The time has come in the history of Cass county when brains should enter more largely into the operations of the farm. There is too much haphazard, unthinking, careless work done for profitable farming. When our soils were in their virgin fertility all that seemed necessary was to sow the seed and reap the harvest, without much care or thought on the part of the farmer. But that time is past, and a more reasonable and rational one should be inaugurated. We should raise more corn, grass, more stock, and consequently more manure. I think the corn crop the least exhausting to the soil of any of the cereals. I have known three successive corn crops taken from an old cultivated field without any apparent decrease of yield, and the land left in the best condition for seeding to clover. On the other hand, a succession of as many wheat crops leave the field much the worse of wear, and well stocked with chess, cockle, sorrel and other weeds, so that it can not be seeded with clover until it has been cultivated with corn at least two seasons in succession. A little space devoted to the consideration of the different varieties of corn will, I think, be proper in this discussion. The varieties are too numerous to mention or discuss in this paper. I shall therefore mention but few of them, that are the most generally cultivated in this vicinity. In the discussion of varieties, for the sake of convenience, I shall consider them in two classes, the Dent and the Flint. In each class there are many varieties, differing materially in regard to size, color, habits of growth and maturity.

The flint varieties are but little raised in this county. I think it might be profitably raised for the purpose of feeding off in the field with hogs. It ripens early and yields well, and serves a good purpose for fattening hogs early and leaves the land in good condition for seeding to wheat. The stalks being short are easily plowed under, and it ripens so early that it can be fed off in good season for wheat, and therefore desirable for that purpose. But for a field crop it would not be a desirable variety to raise, on account of its ears having a large sobby butt, being hard to break off, and is liable to mould in the crib, and when thoroughly dried is too hard and flinty to be profitably eaten by stock, unless ground or cooked. The Dent corn also has a number of varieties and of different shades of color. The most common are the white and yellow. The yellow is the most common and generally raised and preferred by farmers. The general opinion of farmers is that the yellow corn posesses the most nutritive value; but I believe Prof. Kedzie has by chemical analyses proved to the contrary. But so strong does this opinion prevail that but little of the white corn is raised in my neighborhood, and, I believe, in the county. I presume there is but little difference in regard to yield or early maturity.

Of the Yellow Dent there are many varieties, and perhaps none entirely pure. The different varieties of corn are so easily mixed that so long as several of them are raised in the same neighborhood it would be impossible to keep them entirely pure, unless great pains were taken. The pollen is so light that

the wind and insects carry it considerable distances. There is considerable difference in the several varieties in regard to color, size, habits of growth, productiveness, and in maturing. I am not posted as to the number of varieties grown in the county, and will confine myself to the three leading ones grown in my neighborhood, known as the Hathaway, Christopher, and Jones corn. The Hathaway corn is the smallest of the three, and might be properly considered as a medium sized corn of a very uniform yellow color. This variety grows to a good height, with rather small stock, with fair sized ears, with deep grain and small cob; and will shell the greatest weight of corn to the amount of cob of any variety with which I am acquainted. It ripens early and having a small stock and small cob it admits of early harvesting and cribing, without fear of moulding in the crib. It yields well and the stalks make excellent fodder. I think this variety the best adapted to a wide range of soils and circumstances than any variety with which I am acquainted. This variety was originated by Mr. B. Hathaway of Little Prairie Ronde, and under his intelligent and watchful care it is continually improving.

The Christopher corn is very similar in appearance, but is a larger variety, having a larger stalk with larger ears and cob. It matures nearly as early as the Hathaway, but on account of its large stalk and loose cob, does not dry out as early, and consequently does not admit of as early harvesting. It succeeds well on our hilly, timbered lands, with a rich, warm, gravelly soil, but does not succeed so well on as great a variety of soils as the Hathaway. But under favorable circumstances I think it will yield more to the acre. This variety was introduced into this county by Mr. Henry Christopher, from Ohio.

The Jones corn is the largest variety that I am acquainted with. It is yellow, striped with red, and many ears are entirely red. It grows very large stalks, with long large ears, has a large sappy cob, and when grown on rich, strong soil, I think will out-yield any other variety that I know of. It ripens nearly as early as the Christopher, but on account of its large stalk and cob, does not readily dry out, and is liable to mould. The stalks are also too large to make the best of fodder. It was introduced in this country by some of the Joneses of Youngs Prairie, I think from the south.

Corn is the most susceptible of improvement of any of our cereal crops. The intelligent farmer can at his will increase or decrease the size and shape of the ears and grain, and cause it to ripen earlier or later, as he is inclined, by a judicious selection of his seed. This is an important part of our subject, but to discuss it in all of its bearings would extend this paper to too great length. As we increase the size of our corn we make it later, and *vice versa*. Every farmer should have a model case in his mind when selecting his seed, select such as comes nearest the pattern, always remembering that like is more apt to produce like than otherwise. Any dry, warm soil is good for a corn crop, provided it is in good tilth and sufficiently rich. A cold, wet soil, especially if it be a clay soil, should not be planted to corn. Any soil where clay predominates largely is not so reliable as a gravelly or sandy loam. It is more easily affected by drouth or wet. Our best corn lands are our high hilly timbered lands. It is not so liable to be injured by drouth or long continued rains as level lands, and is warmer. The best conditions of soil for a good crop of corn is a clover sod that has lain in pasture one or two years, provided it is not infested with grubs or cut-worms. The next best would be a wheat stubble that had followed a clover soil. I never have had much trouble from grubs or cut-worms on such lands. I have adopted this plan for several years, and think I can safely recommend it. I use all the manure I can make on the clover field intended

for wheat, and to be followed by corn, and find it sufficiently rich for a good crop of corn without any additional manuring except plaster, which I think from what experience I have had, should be applied to the surface broad-cast before plowing. With my present experience I would not recommend plowing for corn in the fall, and would postpone plowing in the spring as late as would be safe to finish the job in season for planting. I like to plant on the fresh plowed land while it is mellow and before the weeds have a chance to start.

For corn I like a deep mellow seed-bed, and would plow seven or eight inches deep on our prairie and timbered land, and on all soils if clay predominates. If on sandy soil where there is no hard pan near the surface, I would not plow over four or five inches; the nature of the soil should determine the depth. All farms do not admit of the same management, and, sometimes the same farm requires different management, and no definite rules can be laid down for all to follow. Every farmer must exercise his own judgment and understand the requirements of his own farm and treat it according to its requirements. If the land to be planted was a stubble field and properly plowed, I would harrow it once over to level it and put it in proper order for the marker, so that it would do its work in the best manner. If a sod, I would recommend harrowing until the surface was level and mellow,—I would use a marker that would mark four rows at a time unless there were obstructions to interfere with its operations. With such an implement one man with a span of horses, will mark from twenty to twenty-five acres in a day. The hills should be at least four feet apart each way, and the rows should be straight as you could stretch a line. It is a repulsive sight to see crooked zigzag rows of corn growing in a level field; the cultivation can be done much better where the rows are straight. Some mark with a small plow making quite a deep furrow; but I do not approve of the plan, I prefer to plant near the surface, having the hills when planted, about even with the surface. The land should be marked both ways, and the planting done across the last marking to insure having the hills in perfect line; I like a close compact hill, so that the plants in the hill will not occupy more than three inches square, so that it will admit of close cultivation. Planting is one of the most important operations to perform in the raising of a crop of corn. A little carelessness in that part of the work cannot be done without material danger to the crop, and an additional cost of cultivating. I deem this part of the subject of sufficient importance to enumerate some of the evils that are sure to result from carelessness in that part of the work:

1st, Planting poor seed so that replanting has to be done, retards the cultivation, gives the weeds a start, and almost doubles the cost both of planting and cultivation and shortens the season for its maturity, and sometimes results in a loss of the crop; 2d, Planting too much seed necessitates the expensive job of thinning; 3d, An insufficient amount of seed lightens the crop. Some farmers advise planting more than they wish to stand, to guard against the loss by birds and cut-worms; but I think that an expensive mode that don't pay. The crows and cut-worms generally take the whole hill, so that replanting would not be saved, and then the undisturbed hills would have to be thinned. Three stalks in the hill I think, will give a better yield of uniform sized ears than more. On good strong soil, with three stalks in the hill, there will scarcely be any nubbins or small ears. It also facilitates husking; a husker can husk two bushels of good sized ears quicker than he could husk one of small nubbins.

No definite time can be fixed for planting on account of the variations of the season. The first of May would be as early and sometimes earlier than it

would be advisable to plant. Planting should commence as early as the season will permit. Better to plant a little too soon than too late. Planting should be finished by the twentieth at farthest. Cultivation should commence as soon as the corn comes up, or sooner will be better. The weeds should be destroyed as soon as they make their appearance. The best implement for the first cultivation is fine-toothed harrow. Twice going over with it will effectually subdue the weeds, thoroughly pulverize the surface, and put it in the best possible condition for the cultivator. Eight or ten acres per day can easily be gone over with such an implement. The cultivation should be continued once a week until the tassels appear, when it should not be disturbed unless circumstances should make it necessary, such as a very heavy fall of rain just after the last cultivation and before the roots of the corn have expanded so far as to be much injured. Cultivation after that time of its growth does more injury than good. The double-shovel plow comes the nearest suiting my idea of a corn cultivator of anything I have ever tried, when in skillful hands, although I have no very serious objections to the double cultivator when properly handled, until the corn gets too tall for it to pass over it. If the cultivation has been timely and properly done where the land is sufficiently free from obstruction, there will be no necessity for hoeing the crop. I believe in as nearly level cultivation as possible, ridging it up only sufficient to cover the small weeds in the hill. The roots will find the proper depth for the healthiest growth if left to themselves. I think ridging up or hilling up with the hoe retarding instead of facilitating its growth.

Harvesting the crop, I think, is of sufficient importance to be considered in this discussion. A very common way, although I think not the best way, is to let the corn stand until it is sufficiently dry and then husk and crib it, letting the stalks stand in the field and pasture them through the fall and winter with stock. This I consider the least expensive way of harvesting.

The next and better way is to cut the corn up at the root and shock it in good order, say sixty-four hills to the shock, and when sufficiently dry, husk and bind the fodder and put three shocks in one, firmly tie the tops with twine and leave in the field until wanted for use. It will cost about one dollar per acre to cut and shock the corn, and one dollar extra per acre for husking, which makes the fodder cost about two dollars per acre. But it is worth as much as a ton of good hay, which I think will repay the extra cost. The third and most economical way is to top the corn by cutting off above the ear and binding in suitable sized bundles, shock it up and let it stand until well cured, then draw to the barn or stack where wanted. This should be done before husking, and while it is in the best condition. Fodder thus saved is the best feed for milch cows, calves and sheep, that I ever tried. The corn should be topped as soon as sufficiently ripe not to shrink the grain. This mode secures the best part of the fodder, and leaves the bulk of the stalks on the field with little else except the husk of any value as feed. It saves a vast amount handling of worthless material. Cattle during the winter will eat all the husks and strip the stalks cleaner than if cut and fed to them; so there is nothing wasted. It also facilitates husking, I think, by exposing the ears to view, and no stalks to hinder pitching it into the wagon. It costs about the same to top it as it would to cut up at the root, but the saving of time in husking I think is at least one dollar per acre. When the corn is sufficiently dry it should be husked and cribbed, which it can be very rapidly and cheaply. A man can husk and crib two-thirds of an acre or forty bushels per day. Corn

should not be sold off the farm. The most profitable way to sell corn is to convert it into beef, pork, mutton, and wool, and sell these products. It is a question with some farmers whether corn can be fed with profit at the present prices. I think it can if fed to the right kind of animals, for it makes a great difference what kind of an animal eats it. It is a ruinous practice to sell corn off the farm. Better buy it than sell, in order to keep up the fertility of our farms. I will now close by giving a few figures in regard to the cost of raising a bushel of corn:

For the use of the land per acre	\$5 00
Plowing 1½ acres per day at \$2.00 per acre	1 33
Dragging once	20
Marking both ways	20
Seed four quarts	15
Planting at the rate of 2½ acres per day, per hand at \$1.00	40
Dragging the corn twice	50
Cultivating four times, 35c per acre	1 40
Husking and cribbing per acre	1 25
Total cost of one acre	\$10 48
Fodder estimated above cost of cutting	3 00
Reduces the cost to	\$7 58
An average crop of 60 bushels per acre—60 bushels	7 58
Cost per bushel, \$0.12.63.	

By this calculation a crop of corn averaging sixty bushels per acre costs a fraction over twelve and one-half cents per bushel. In this calculation labor has been estimated at one dollar per day, including board and team at the same price; the cultivating at the rate of four acres per day, which can be done with the double shovel plow, and one horse; whereas if the double cultivator is used the cost will still be less. The crop estimated at sixty bushels, which can easily be raised on most of our best corn lands with proper cultivation.

DISCUSSION.

F. A. Gulley.—How do you save your seed?

Mr. Gard.—I select the best ears while husking; these I spread on a floor where there is warmth underneath.

Do you plant all the corn that there is on the ear?

Mr. Gard.—Generally I do, but if I find imperfect grains on the tip of the ear I do not plant them.

Mr. Hathaway said he was the originator of what was called the "Hathaway corn." It was the result of crossing two varieties of early Dent. He continued to select year after year, those ears that came nearest his ideal of perfection. He sent a sample of his seed corn two years ago to the college farm, and last year they had sent for five bushels of it, and the yield, according to the Prof. of Agriculture, was sixty bushels of shelled corn to the acre.

This corn matures early and I do not care to plant till the 20th or 25th of May. I have had it ripen thoroughly when planted in June.

Capt. Hendryx was of the opinion that generally speaking sufficient care was not exercised in planting corn.

Mr. D. Woodman said he had tried a good many varieties of corn, and preferred the Yellow Dent to any other that he had tried.

Mr. Griffiths.—I plow my corn ground in the fall and cultivate before planting, and usually succeed well with corn.

Mr. Lawrence.—It pays to exercise great care in planting so as to have the right quantity of seed in the hill and to have it properly covered. I use the two-horse planter, it saves time and does excellent work.

Mr. F. P. Lee read the following essay on

CATTLE.

If we would be successful breeders of cattle, we should give to our cows an abundant supply of healthful food, proper shelter and exercise; then select the best bull we can afford to purchase, for crossing with them; and when this is accomplished, we have employed more or less imperfectly all the processes under which the domestic animals of the same species develop into breeds. Good food, or the lack of it, exercise in moderation or excess, shelter or exposure, and selection or carelessness in crossing, these make up the sum total of the influences which modify constantly, for better or for worse, our horses and cattle, hogs and sheep. The form, constitution, and temper of every domestic animal is, aside from the characteristics of the species, the effect of the interplay of these causes.

Judicious feeding, careful treatment in shelter and exercise, and skillful selection for coupling, are the key notes to the breeder's art. If one of these be lacking, breeding is nearly a failure. If all are defective, the animals that result are well nigh worthless. We must be careful in regard to mating. The breeder should notice the defects of the female he wishes to breed, and couple her with a male as nearly perfect as possible; and especially strong in the points where she is weak, and by so doing for a few generations, we shall have arrived nearly at perfection.

What kind of cattle shall we breed? If we desire a butter maker alone, I answer a Jersey; because we are sure of a fair quantity of an extra quality of butter. If for milk and cheese, the Ayrshire or Holstein. If for working oxen, the Devon. If for beef, the Hereford. But if you want an animal combining all these qualities, I answer, the

Shorthorn,

because there is no race of cattle that combines the qualities of labor, beef, and milk in such a large degree, as the Shorthorn. This has been fully tested in this country and England. The London dairies are full of the Shorthorns and their grades. And the dairy men of this country are to a considerable extent introducing Shorthorns into their herds. They are heavy milkers, and make a large quantity of butter, and when fattened for the butcher, furnish a good carcass of excellent beef. That Shorthorns cross best with all other breeds, is a fact past contradiction. That they are pre-eminent as a milk and beef breed, has been proven by their spreading all over the world. Wherever they have been introduced they have improved the other breeds of cattle. It has been shown beyond controversy that the older an animal becomes, the more food is required to make a pound of meat. Then the younger an animal can be brought to maturity, the more profit there is in him, and I think the Shorthorn can be brought to maturity younger than any other breed. They are of a quiet disposition, easy to handle, and are, therefore, easily fattened. The

heifers when properly bred make good cows; and the grade Shorthorn cows in the vicinity are far superior to any other breed. A calf should be well kept from birth. The system usually practiced is to let the calf suck the dam from one to three days, and then feed a mixture of new and skimmed milk for a week more, when they are fed on skimmed milk alone, until eight or twelve weeks old, then they are turned on short dry pasture and told to pick for themselves; many persons keeping three on the food that one requires, and at the age of six months reach the astonishing weight of 175 to 250 pounds; and at a year 350 to 400 pounds. Now, there are but few who can afford to allow the calf to suck the dam, but a good calf may be raised on 20 lbs. of skimmed milk, and one pint of bolted oat meal and middlings per day, for the first three months, after which the quantity of milk may be diminished. I know a grade heifer raised on this ration, that at fifteen months weighed 800. Another at 3 years that had born two calves, and a heavy milker, weighed 1,270 lbs. There is a thoroughbred Shorthorn bull in our neighborhood, that weighed at birth, July 5th, 1877, 110 lbs. He was allowed to suck the dam, with what he picked in the pasture, until the first of November, when he was fed a pint of corn meal, and one quart of bran per day until March, then weaned from the dam and fed three quarts of oats and bran per day for two and a half months, when he was turned to pasture and fed no grain until the first of August, when the oat and bran ration was resumed, and on November 23d, 1878, at sixteen months and eighteen days old, weighed 1,255 lbs., a gain of 1,145 lbs., or an average daily gain of 2.36. But some say it costs too much to keep a Shorthorn, and I have repeatedly been told that a Shorthorn cow would eat three times as much as a native; and to satisfy myself, I tried an experiment. We owned a native pure and undefiled, black, with white face, as good a native cow as lived; at the same time a three-fourth Shorthorn cow. roan in color, the native five and the other four years old. They were giving the same amount of milk, and making the same quantity of butter; the grade being a third the larger when put into the stable in November. I carefully measured everything they were fed, and there was a difference of one-fifth in favor of the Shorthorn.

How shall we procure these cattle? Let a neighborhood buy a bull, as good as they can afford, and use him a couple of years, then buy another to use on the first ones got, and in a few years you will have a fine lot of grade cows and steers, that, if cared for as I suggest, will weigh fifteen hundred pounds at two and a half years old, double the weight of a native, and one that will bring two cents more per pound.

I have mainly referred to the Shorthorn for the reason that I believe it is to this breed that we are to look for the general improvement of the cattle of the country.

I do not underestimate the value of several other breeds for certain purposes, but for the use of the general farmer, I do think the Shorthorn is best adapted.

Now in conclusion, I will add that every one who would be a successful breeder of domestic animals, should subscribe for some periodical devoted exclusively to that interest. As for myself I owe much of my success in the business to the National Live Stock Journal.

Mr. John S. Gage read an essay on gypsum, which we regret being unable to publish, not having the manuscript. This essay and the discussion upon it closed the afternoon session.

EVENING SESSION.

R. G. Baird, Secretary of the State Board of Agriculture, gave a lecture on the "Conditions of Successful Agriculture." (See Lectures given at more than one Institute.)

Mr. C. C. Morton read the following essay on

SHEEP.

The history of sheep husbandry dates back to almost as remote a period as that of man, and from that time to the present, has justly occupied a prominent position in the commerce of all civilized nations of the world, being a source of luxury, ornament and profit, and when John Randolph, of Roanoke, publicly proclaimed that he would at any time go a mile out of his way to kick a sheep, he virtually asserted that it would be a luxury to abuse his best friend. I do not propose in this brief essay to give the origin or history of the various families or kinds of sheep, but will view the subject as it exists in our country at the present time, as a branch of mixed husbandry.

That a flock of sheep is a necessity on the farm, I unhesitatingly assert. As laborers in the field they are industrious and thorough, feeding upon briars and many other species of vegetable vermin, consuming much of all kinds of forage, both in summer and winter, that is rejected by other stock, and converting it into, and distributing over the field a more valuable fertilizer than it would be in a crude state. As this is emphatically an age of dollars and cents, the question naturally arises, what kind of sheep is best adapted to our circumstances?

We have several varieties from which to select, and it is all important that we select that which has the appearance of being the most remunerative.

If we keep the larger or coarser wooled kind, with a view of supplying the market at home or abroad, with mutton, we must provide broad acres of pasturage in summer, and an abundant supply of the most succulent and nutritious food for winter consumption, and then limit the number to a comparatively small flock, provide ample housing, and be satisfied with a light annual yield of fleece.

If we select the merino, or a high grade of that kind, we may safely increase the number from thirty-three to fifty per cent., thus furnishing more laborers in the field to produce fertilizers, thereby paying thir own way. I think the merino may be successfully wintered without the usual ration of hay, by judiciously alternating corn stalks and straw, and from one-half to one bushel shelled corn per 100 head per day; or, what is still better, from two to three bushels of field turnips, in place of the corn.

Right here excuse a slight divergence from my subject, and allow me to state that the flat turnip is a crop which may be produced at a trifling expense. The *modus operandi* is to plow over a plat of wheat stubble, harrow smooth, and sow from July 20th to 30th, about one-fourth pound of seed per acre, and harrow in, which is all the labor necessary, until the time arrives to harvest, when the roots may be stored in a cellar, or buried in pits of twenty-five or thirty bushels each. For convenience they should be stored near the yard, and may be fed once or twice a day. The juice of the turnip, with the saccharine and assimilative properties it contains, gives it great value as winter forage for most kinds of stock.

Feeding should be done at regular intervals, in a quiet manner, always

avoiding frightening, hastily driving, or otherwise worrying the flock. Great care should be observed that no hay or chaffy straw is carried on their backs to encumber the wool, for once there no amount of washing will take it out, and although not as unsightly as burrs, it is more difficult to separate from the fleece.

After having proceeded thus far, you may readily perceive that my favorite is the merino, and the purer the blood the better. As may be seen by reference to the statistics of Michigan, compiled from the census of 1870, the average yield of fleece per head was a fraction over 4.46 pounds.

Berrien county has done comparatively little towards cultivating the merino, and when any improvement has been made, it hes been counteracted by crossing with larger breeds. In that county in 1870, the 25,951 sheep, yielded 90,309 pounds of wool, or a fraction less than 3.47 per head.

Van Buren, with 32,884 sheep, yielded 120,676 pounds, or 3.65 per head.

Cass county, a fraction over 3.97 pounds per head.

Kalamazoo, 3.92.

St. Joseph, 4.33.

Branch, 4.20.

Calhoun, 4.38.

Jackson, 4.75.

Hillsdale, 4.49.

Lenawee, 4.92.

Washtenaw, 4.75.

Macomb, 4.95.

From the Country Gentleman we learn that the average yield in the State of New York in 1874, was 4.95. The greatest number of fleeces produced in any one county was in Ontario, which gave an average of over 6.02. The lowest average in any county of the State, the same year, was 3.47 lbs.

The above comparison of the average yield of wool in the various localities, is evidence that where the most attention has been given to high breeding, the balance sheet is in their favor. For instance, when we compare the county of Berrien with Macomb, we find the balance to be 1.48 in favor of the latter, which in eight years, or what is estimated as the average age of stock sheep, amounts to a difference, at thirty cents per pound, of $3.55 per head, an amount probably above the average price of stock sheep in that county.

There is no reason why this locality may not, with the same care and attention given to breeding, attain as high a standard of excellence, as regards both quality and quantity, as Lenawee or Macomb, or even that of Ontario county, N. Y.

Many intelligent farmers assert with much confidence that they consider feed of more importance than breed, but a judicious system exacts close attention to both.

In the matter of breeding, there is no middle ground to take, we must either advance or recede. One careless, injudicious cross will frequently counteract years of judicious breeding. Care of the flocks during the time of yeaning, is an item not to be lost sight of. A few hours' absence from the flock frequently endangers the life of several lambs, and in many instances that of the ewe, which the expenditure of a few moments' care at the proper time might avert.

Goitre in lambs was much more prevalent a few years since than now. Doctors disagree as to the cause of this disease or defect. My own experience and observation prompts me to believe that it is the result of inflammation in the gums, produced by inability to cut the teeth, communicated to the glands of

the neck. Whether this be the case or not, in every instance of this disease, of which I have knowledge, an examination has revealed the fact that the teeth were not cut through, and the gums were inflamed and swollen. The artificial cutting of the gums has seldom failed to effect a cure.

Closely following the yeaning season comes the huge farce of washing sheep, as if it was a process necessary to prepare the wool for the manufacturer to work up; a labor performed at the peril of both man and beast, only to avoid the "one-third deduction rule on all unwashed" wool, when in fact all wool, whether fleece washed or unwashed, is subjected to a cleansing process before it can be successfully manufactured. A farce, I repeat, because no difference how much foreign matter it may contain, one-third is the shrinkage, immaterial how free from filth the unwashed may be the rule of shrinking one-third on all unwashed is rigidly adhered to. So long as the unjust rule of indiscriminate shrinkage is continued, just so long will the barbarous practice of washing sheep be continued. It is to be hoped that more equitable councils may prevail, and that wool, whether washed or unwashed, will be sold strictly on its merits, like other products of the farm.

The sheep after having successfully subdued the vegetable vermin of the farm, produced the annual fleece, and reared a numerous progeny, retires to the stall, and by a systematic course of feeding, is successfully converted into mutton, which if properly fattened, commands a ready market, the merino bringing as high a price per 100 pounds as the sheep that has been reared with the single object of body in view; thus exceeding the old adage, that "the tread of the sheep is golden." Its whole lifetime has been a pecuniary success, and the closing scene is one of profit to its owner.

DISCUSSION.

Mr. Morris said he thought goitre in sheep was often caused by too close confinement in winter.

Hon. J. J. Woodman said that it was the opinion of many physicians in Switzerland that goitre was caused by the sheep having to eat snow and drink snow water, in order to quench their thirst. Physicians in Canada had been investigating the matter and had a similar opinion. He did not know whether that was the cause of goitre. He had never had a case of it in his own flock, these he always supplied with plenty of good water.

Mr. Henry Straub read the following essay on

SMALL FRUITS.

There is no good reason why every farmer's family should not be well supplied with small fruit. A few rods of ground well tended in small fruit will yield a richer return than the same amount of ground devoted to any other purpose.

Fruit is no longer considered simply as a luxury, but is now generally recognized as necessary to good health.

The apple has always been the principal supply of fruit for the farmer, but it does not come until the middle of summer, leaving the fore part of the season wholly unsupplied with fruit, excepting a few small wild strawberries or raspberries that might occasionally be gathered in the meadows, fence-corners, or waste places of the farm. But the skill and patience of the horticulturist have changed all this. These wild fruits have been so improved by cultivation, that we have now varieties of strawberries and raspberries so large, luscious, hardy and productive, that a few rods of ground and a little intelli-

gent labor will supply a family with an abundance of these, first, and among the best and most healthy fruits of the season. Yet how few farms do we see on which any of these fruits are produced in any degree of perfection!

The history of small fruits on a farm is often something like the following: The nursery agent comes along and exhibits his beautiful plates of new and rare varieties. The family is delighted at the possibility of having a plentiful supply of fine fruit. Several dozen or hundred of plants are purchased and set out. Want of knowledge how to treat the plants, or neglect, or poor varieties—either, or all of these causes combined—disappoint the family in their expectations. The strawberry bed becomes a bed of matted vines and grass, and the raspberry bushes are imbedded in a junegrass sod, the young canes are interwoven with the old ones, the whole forming a jungle of briars in which the pickers force their way with pain and difficulty.

Now let us look at a brighter side. The most important small fruits are the strawberry, the raspberry and the grape. I shall say nothing about the grape, as that will be treated by another essayist. The blackberry is so uncertain in this latitude, excepting near the lake, on account of winter killing, that I would not recommend farmers to spend much time with it. Yet some years we can raise a fine crop of this excellent fruit. It should be planted in soil not too rich, from four to six feet apart, and the young canes should be pinched off when four or five feet high. In other respects it should be treated like the raspberry. The Kittatinny is the most successful variety for this climate.

The currant has been too common in the farmer's garden for years, to receive much notice here. Clean culture, frequent manuring and mulching, and cutting out the old wood and superfluous canes, and cutting the longest ones back every year or two, will generally insure a bountiful crop of this fine fruit.

The most important of the small fruits is the strawberry; not only because it is one of the best fruits, but, principally, becouse it is the first fruit of the season and wholly without a rival. Green Prolific, Charles Downing, Michigan, are good varieties, but for all circumstances, Wilson's Albany is still unrivalled. Any soil that will produce good corn or potatoes will produce good strawberries; it may, however, be so rich as to produce foliage at the expense of fruit. The best time for planting is in September, or as soon as the young plants are well rooted. Always set your plants after a rain or during a rain; never allow the roots to wilt. If planted in the fall they should be lightly covered with straw or coarse manure, as soon as the ground freezes, to prevent winter-killing. Especially should this be done where the soil is heavy and liable to heave. If planted in the spring the buds should be pinched off to insure a vigorous plant. The plants should be set from twelve to eighteen inches apart in the row, and if it is designed to use the cultivator the rows should be three and a half or four feet apart: but if not, they may be from two and a half to three feet apart. The young plants should be cultivated several times in the spring before the runners begin to shoot, using the hoe around the plant, and not allowing a weed or any grass to get any foothold. If this is thoroughly done all subsequent culture will be easy. As soon as the runners begin to shoot you must decide what method of training you will adopt. If you decide to keep the plants in hills, you must cut or pull off the runners as fast as they appear, and keep up the culture until towards fall. From neglect the runners are sometimes allowed to remain until they have formed plants which are then hoed out. This is ruinous, for the parent plant has spent its

energies on the young plant, and the best way then is to let the new plant remain. One objection to cultivating in hills is, that the hills are sometimes destroyed by worms, leaving large vacant spaces.

Another and equally good method is, to allow the runners to remain and form new plants, only cutting the runners between the rows. In the fall the plants should again be slightly covered, especially on heavy soils. In the spring this mulching should be raked off and the ground well stirred, but before the berries begin to ripen the mulching should be returned, in order to keep the fruit clean, and also to afford protection in dry weather. If it is desired to raise another crop from this bed the mulching should be removed as soon as the fruit is gathered, the ground cultivated, and the runners kept off during the summer. The following spring they should be treated as they were the previous spring. A fair crop will be produced but the berries will be smaller. In the meantime another bed should be on the way to take the place of this next year. If it is desired to have only the finest fruit every year, only one crop must be taken from the same bed, unless they are cultivated in hills.

Immediately after the strawberry comes the raspberry. Good corn ground will raise good raspberries; provided, always, that for all kinds of small fruits the soil must be dry and as high as possible. Early spring is the best time to set raspberries. The proper plants to set are, of the red varieties, suckers of the previous year; and of the black caps, the plants produced at the end of the tips the previous summer. The black caps may be set about four by six feet apart, and the red varieties a little closer. These young plants should be cultivated like corn, but not later than July. The young canes should be pinched off when about a foot high, in order to produce branches. The following spring the laterals or side branches should be cut back to eight or twelve inches in length. The ground should be kept loose by cultivation until the fruit ripens, and should again be cultivated after the fruit is gathered. The young canes should now be allowed to grow two or three feet high before they are pinched off. The following spring the old canes should be removed and the branches shortened to eighteen inches or two feet. The same treatment should be practiced every year so long as the plants remain productive, which may be six or eight years.

Mulching with straw or coarse manure is of great advantage. It will keep weeds down, keep the soil loose, moist, and rich, and dispense with much cultivation.

Of the red raspberries the Philadelphia and Purple Cane are leading varieties. Among Black Caps, Davison's Thornless, Doolittle and Mammoth Cluster are leading varieties, the last being the best.

To the able-bodied women of the farm I would say, that when the men are so engrossed by the labors of the farm that they cannot attend to the fruit garden, it would add to your health, beauty and usefulness, occasionally to engage in the noble profession which mother Eve adorned in the days of her innocence.

After the adoption of resolutions of thanks to the professors, and others, who had contributed papers and lectures, the institute was declared adjourned.

LECTURES GIVEN AT MORE THAN ONE INSTITUTE.

AGRICULTURAL CAPABILITIES OF THE SOILS OF THE NORTHERN COUNTIES OF THE LOWER PENINSULA.

BY R. C. KEDZIE.

[A lecture delivered at the Farmers' Institutes at Dowagiac and Bay City.]

No State in our union has suffered more in reputation by reason of false statements and ignorant representations than Michigan. At the time of its earliest settlement, to the popular apprehension the far off and unknown Michigan was only, and would forever remain, the home of the stealthy wolf, the cruel Indian, and deadly disease. For the white man it was uninhabited and uninhabitable. In a report made to a religious body in regard to the feasibility of establishing missionary stations in order to christianize this heathen wild, it was stated that the project was impracticable, "because only a narrow strip along the border of the territory was inhabitable, the interior being a vast and impenetrable swamp."

In his admirable address at the laying of the corner stone of the new capitol, Hon. W. A. Howard made the following extract from the report of the surveyor-general of Ohio, bearing date November 30, 1815. "The country on the Indian boundary line, from the mouth of the great Auglaize River, and running thence for about fifty miles, is (with few exceptions) low, wet land, with a very thick growth of underbrush, intermixed with very bad marshes, but generally very heavily timbered with beech, cottonwood, oak, etc.; thence continuing north and extending from the Indian boundary eastward, the number and extent of the swamps increases with the addition of numbers of lakes from twenty chains to two or three miles across. Many of the lakes have extensive marshes adjoining their margins, sometimes thickly covered with a species of pine called tamarack, and other places covered with a coarse, high grass and uniformly covered from six inches to three feet (and more at times) with water. The margins of these lakes are not the only places where swamps are found, for they are interspersed throughout the whole country, and filled with water, as above stated, and varying in extent. The intermediate space between the swamps and lakes, which is probably near one half of the country, is with a very few exceptions a poor, barren sandy land on which scarcely any vegetation grows, except very small scrubby oaks. In many places that part which may be called dry land, is composed of little short sand hills, forming a kind of deep basins, the bottoms of many of which are composed of marsh similar to the above described. The streams are generally narrow and very deep, compared with their width, the shores and bottoms of which are (with a very few exceptions) swampy beyond description; and it is with the utmost difficulty that a place can be found over which horses can be conveyed.

"A circumstance peculiar to that country is exhibited in many of the

marshes by their being thinly covered with a sward of grass, by walking on which evinced the existence of water or a very thin mud immediately under their covering, which sinks from six to eighteen inches from the pressure of the foot at every step and at the same time rising before and behind the person passing over. The margins of many of the lakes and streams are in a similar situation, and in many places literally afloat. On approaching the eastern part of the military lands towards the private claims on the straits and lake, the country does not contain so many swamps and lakes, but the extreme sterility and barrenness of the soil continues the same. Taking the country altogether, so far as has been explored, and to all appearances, together with the information received concerning the balance, it is so bad there would not be more than one acre out of one hundred, if there would be one out of one thousand, that would in any case admit of cultivation."

From the number of persons who, from that day down to the present hour, have continued to decry Michigan in whole or in part, we conclude that the surveyor-general of Ohio had a large family! Even if some fertile tract could be found amid this "extreme sterility and barrenness," according to their gloomy prophecy, the swift-footed Indian, or sure-footed disease would soon exterminate the daring intruder. Fifty-three years ago my father, with his young family, left the banks of the Delaware to seek a home on the banks of the Raisin in far-off Michigan. As we turned our faces towards the setting sun, our friends regarded it as the sun-set of hope and life for us; they bade "farewell,—everlasting farewell to the family doomed to extinction in the savage wilds of the Michigan!"

But as settlers poured into our new territory they were both surprised and delighted to find, instead of sterile sand-hills and impassable bogs, a region of wonderful beauty and fertility; thus one zone of counties after another was taken from the supposed dominion of chimeras dire, and pronounced to be "the best farm lands upon which the sun ever shone." The defamers of Michigan, while conceding their mistake about these counties, only the more stoutly asserted that the rest of the State was unfit for agriculture. Their old rallying cry was "impenetrable swamps," "sterile sand-hills;" their modern slogan is "pine barrens,"—"lumber country unfit for farming." I do not suppose that the defamers of our State were moved by malice in making such wild assertions; theirs was the sin of ignorance, to be winked at, albeit the wink may press out a tear. But who shall say how many persons by such ignorant assertion and reckless statement have been deterred from making their home in the best State in our union? It was sin that drove the first pair from the primal Eden, but ignorance has barred out thousands of their children from many an earthly paradise.

When we cast our eyes upon the map of our country we are struck with the unique position which our peninsula occupies in comparison with other lands lying in the same latitude,—Canada on the east and Wisconsin and Minnesota on the west. We mark how nature hugs with her protecting arm of *water* the beautiful peninsula, and pours out these vast "unsalted seas" a rampart against the cold. Some of this protection is felt in the southern counties, but the fullness of its blessing is reserved for the northern counties, which nature holds in the hollow of her sheltering hand. If other lands lying in the same latitude, but without this singular protection of water, are fitted for the prosperous pursuit of agriculture, how much more the crown of the peninsula! Its geographical position and surroundings point it out as eminently fitted for productive industry, while its easily available water-carriage will save it from

the withering touch of monopoly in transportation. Such a region must occupy a prominent position in the world's industries, unless these exceptional advantages are offset by unusual disabilities.

The enormous wealth of this region in its lumber has so filled the public eye that it could not see the yet greater wealth of its soil. The consequence has been that while it has been the scene of great activity in lumbering, it has only slowly and tardily acquired population, from the plausible but false impression that because it was good for lumbering it could not be good for farming—in fact, that the better it was for lumber the worse it must be for agriculture—as if a soil that could sustain such a wonderful forest growth must be incapable of growing anything but wood. As a consequence of this erroneous supposition men of other States and men of our own State, when seeking for new lands to make new homes, have turned their backs on ready markets, available transportation, schools and churches, security and civilization, to seek in the far West their resting place, amid the wild disorder, discomfort and insecurity of border life. They reached for sunset and grasped a shadow. So far as soil alone is concerned they have "gone further and fared worse:" when we take into account the conditions of climate, the want of markets, and above all, the absence of that civilized and orderly society which alone commands security for all and safety even for the weakest, we see how grave is the blunder which has led them to pass by Michigan to seek homes in Kansas, Nebraska and Dakota, or to turn their weary feet to the "sunny South," only to encounter the deadly fevers and wasting malaria of that deceptive clime. The great mass of these reckless wanderers have rejected Michigan as a home because they were in absolute ignorance of this region—of its soil, productions, capabilities for cultivation, and its adaptedness to make a desirable home.

Two years ago I had a glance at some of these Northern counties during a trip to attend a Farmer's Institute at Traverse City. What I then saw awakened an earnest desire to know more. A soil that could bear such magnificent forests and could ripen apples so nicely colored, as if the yellow and red fingers of sunset had grasped the fruit and would not let go—surely such a region and such a soil were worthy of careful study. But the ground was all covered with snow, and all plans of study and investigation must be postponed to a more convenient season. But the desire and the purpose to know more of this section of our State did not die out, and last spring I entered upon the work in good earnest. My object was to direct public attention to the resources and capabilities of that portion of our State which had been overlooked too long for the best interests of the commonwealth.

I could not leave my work at the college to personally examine these new counties, and if I could I would thus satisfy myself instead of convincing others. If I could place before others the means by which they could form an intelligent and just opinion in regard to the agricultural capabilities of these northern counties, I would do the public better service than by any amount of personal examination, which could bear no better fruit than personal assertions in respect to this region. I preferred to merely bring the witnesses into court, to examine and cross-examine them there, and leave the public to be judge and jury in the case. It seemed to me that I could best do this by gathering characteristic specimens of soil from as many representative points as possible, submit these to chemical analysis, examine the physical properties and characteristics of these soils, and then present the results of these investigations and the soils themselves to the public, and ask an enlightened public opinion to give a verdict in the case.

CHEMICAL ANALYSIS OF SOILS.

When chemistry was first applied to the problems of agriculture, it was supposed that the greatest benefit which chemistry could impart to agriculture was to be derived from the analysis of the soil. It was supposed that the fertility of any soil, the kind of crop it was fitted to raise, or the material which must be added to the soil to develop its greatest productiveness, were each and all to be determined simply by a chemical analysis of the soil. These extravagant anticipations have not been realized. It is found that chemical analysis will not always distinguish between a fruitful and an unfruitful soil; because a soil may be unproductive for physical reasons, though it may still contain all the chemical elements of fertility. The utter break-down of Liebig's mineral theory of manures when put to the test of experience rang the knell of mere soil analysis.

But if chemical analysis failed when so much was demanded of it, we are not to go to the other extreme and conclude that because it is not good for everything it is good for nothing. Chemical analysis of the soil is of value in determining whether a soil is capable of fertility, or the contrary; also in determining the degree of its possible fertility. There are certain ash elements which are absolutely necessary for plant growth. In the absence of any one of these, vegetable growth is impossible; if the supply is relatively limited, plant growth will be limited correspondingly. If all the ash elements are present in sufficient amount and in available form, such soil is capable of fertility. Hence the chemical analysis of a soil is of importance in determining the possibility of fertility and of the relative fertility which may be secured under favorable conditions.

Having thus put you upon your guard against overestimating the importance of chemical analysis of soils, I present the results of analysis of thirty-one soils of Michigan. Below each analysis will be found a separate line giving the total ash elements in one hundred parts of the soil:

MICHIGAN SOILS, AND THE RESULTS OF THEIR CHEMICAL ANALYSIS

No. 1.—River Raisin Bottoms.

Deerfield, Lenawee Co.
Selected by Geo. H. Kedzie.
Timber: ash, lynn, hickory, black walnut, oak, etc.
Soil cultivated for 40 years without manure.

Sand and Silica	58.17
Alumina	6.48
Oxide of Iron	7.62
Lime	1.98
Magnesia	1.43
Potash	1.84
Soda	1.20
Sulphuric Acid	.32
Phosphoric Acid	.40
Organic matter containing .42 Nitrogen	10.97
Water	9.45
Total Ash-food	7.17
Capacity for water	65.60

No. 2.—River Raisin Bottoms.

Deerfield, Lenawee Co.
Selected by Geo. H. Kedzie.
Timber: ash, lynn, black walnut, etc.
Virgin soil.

Sand and Silica	62.42
Alumina	10.64
Oxide of Iron	3.46
Lime	2.10
Magnesia	1.59
Potash	2.05
Soda	1.19
Sulphuric Acid	.24
Phosphoric Acid	.41
Organic matter containing .37 Nitrogen	9.39
Water	6.08
Total Ash-food	7.58
Capacity for water	61.20

No. 3.—Burr-Oak Wheat Lands.

Saline, Washtenaw Co.
Selected by J. S. Wood.
Timber: burr-oak.

Sand and Silica	81.00
Alumina	5.23
Oxide of Iron	4.66
Lime	1.28

Magnesia	.86
Potash	1.18
Soda	.19
Sulphuric Acid	.42
Phosphoric Acid	.40
Organic matter containing .11 Nitrogen	2.98
Water	1.72
Total Ash-food	4.33
Capacity for water	36.30

No. 4.—Prairie Soil.

Volinia, Cass Co.
Selected by M. J. Gard.
Soil has been pastured, but never cultivated.

Sand and Silica	63.77
Alumina	3.72
Oxide of Iron	5.11
Lime	2.02
Magnesia	.66
Potash	1.18
Soda	.56
Sulphuric Acid	.13
Phosphoric Acid	.44
Organic matter containing .23 Nitrogen	12.30
Water	10.19
Total Ash-food	4.99
Capacity for water	73.20

No. 5.—Prairie Soil.

Volinia, Cass Co.
Selected by M. J. Gard.
Soil has been cultivated for 30 years: has been plastered.

Sand and Silica	75.74
Alumina	4.20
Oxide of Iron	5.46
Lime	1.38
Magnesia	.56
Potash	1.10
Soda	.43
Sulphuric Acid	.18
Phosphoric Acid	.33
Organic matter containing .21 Nitrogen	7.50
Water	3.10
Total Ash-food	3.98
Capacity for water	50.55

No. 6.—South Haven, Van Buren Co.

Selected by A. S. Dyckman.
Timber: hemlock.

Sand and Silica	87.23
Alumina	2.87
Oxide of Iron	1.52
Lime	.51
Magnesia	.46
Potash	.83
Soda	.34
Sulphuric Acid	.20
Phosphoric Acid	.13
Organic matter containing .07 Nitrogen	3.41
Water	2.23
Total Ash-food	2.47
Capacity for water	44.70

No. 7.—Gilmore, Isabella Co.

Sec. 16, T. 16 N., R. 5 W.
Selected by P. H. Robbins.
Timber: hardwood.

Sand and Silica	88.13
Alumina	3.77
Oxide of Iron	2.40
Lime	.87
Magnesia	.27
Potash	.86
Soda	.37
Sulphuric Acid	.16
Phosphoric Acid	.19
Organic matter containing .08 Nitrogen	2.35
Water	.52
Total Ash-food	2.72
Capacity for water	49.60

No. 8.—Warren, Midland Co.

Sec. 29, T. 16 N., R. 2 W.
Selected by John Reardon.
Timber: pine, hemlock, maple, and beech.

Sand and Silica	84.64
Alumina	3.80
Oxide of Iron	1.31
Lime	.86
Magnesia	.16
Potash	1.09
Soda	.34
Sulphuric Acid	.14
Phosphoric Acid	.35
Organic matter containing .21 Nitrogen	5.30
Water	2.01
Total Ash-food	2.94
Capacity for water	51.15

No. 9.—Midland, Midland Co.

Sec. 21, T. 14 N., R. 2 E.
Selected by Geo. F. Ball.
Timber: beech, maple, oak, and lynn.

Sand and Silica	67.20
Alumina	6.31
Oxide of Iron	7.91
Lime	1.64
Magnesia	1.23
Potash	1.85
Soda	1.15
Sulphuric Acid	.30
Phosphoric Acid	.49
Organic matter containing .22 Nitrogen	7.48
Water	4.00
Total Ash-food	6.66
Capacity for water	51.40

No. 10.—Sheridan, Clare Co.

Sec. 22. T. 17 N., R. 3 W.
Selected by J. C. Rockafellow.
Timber: pine, hemlock, birch, and maple.

Sand and Silica	93.31
Alumina	2.03
Oxide of Iron	1.40
Lime	.36
Magnesia	.16
Potash	.54
Soda	.26
Sulphuric Acid	.08
Phosphoric Acid	.15
Organic matter containing .03 Nitrogen	1.34
Water	.37
Total Ash-food	1.55
Capacity for water	43.10

No. 11.—Chase, Lake Co.

Sec. 9, T. 17 N., R. 11 W.
Selected by J. Brown.
Timber: maple, elm, hemlock, lynn, etc.

Sand and Silica	87.32
Alumina	3.22
Oxide of Iron	2.10
Lime	.62
Magnesia	.28
Potash	.90
Soda	.63
Sulphuric Acid	.10
Phosphoric Acid	.23
Organic matter containing .12 Nitrogen	3.78
Water	.55
Total Ash-food	2.76
Capacity for water	45.55

No. 12.—Grant, Clare Co.

Sec. 24, T. 17 N., R. 4 W.
Selected by J. C. Rockafellow.
Timber: maple, beech, lynn, ash, oak, etc.

Sand and Silica	71.45
Alumina	6.50
Oxide of Iron	7.18
Lime	.99
Magnesia	.73
Potash	1.90
Soda	1.20
Sulphuric Acid	.19
Phosphoric Acid	.36
Organic matter containing .16 Nitrogen	5.90
Water	3.10
Total Ash-food	5.37
Capacity for water	44.90

No. 13.—Webber, Lake Co.

Sec. 33, T. 18 N., R. 13 W.
Selected by Geo. W. Townsend.
From "the plains."

Sand and Silica	92.48
Alumina	2.22
Oxide of Iron	1.59
Lime	.35
Magnesia	.30
Potash	.73
Soda	.32
Sulphuric Acid	.06
Phosphoric Acid	.14
Organic matter containing .04 Nitrogen	1.22
Water	.40
Total Ash-food	1.90
Capacity for water	35.30

No. 14.—Evart, Osceola Co.

Sec. 17, T. 17 N., R. 8 W.
Selected by F. York.
Timber: hardwood mixed with pine and hemlock.

Sand and Silica	83.80
Alumina	5.10
Oxide of Iron	3.24
Lime	.80
Magnesia	.64
Potash	1.19
Soda	.52
Sulphuric Acid	.12
Phosphoric Acid	.29
Organic matter containing .07 Nitrogen	3.06
Water	1.24
Total Ash-food	3.56
Capacity for water	45.80

No. 15.—Eden, Mason Co.

Sec. 16, T. 18 N., R. 16 W.
Selected by C. E. Resseguie.
Timber: hardwood with hemlock.

Sand and Silica	92.46
Alumina	2.99
Oxide of Iron	1.23
Lime	.66
Magnesia	.12
Potash	.65
Soda	.23
Sulphuric Acid	.10
Phosphoric Acid	.22
Organic matter containing .03 Nitrogen	.87
Water	.27
Total Ash-food	1.98
Capacity for water	32.40

No. 16.—Eden, Mason Co.

Sec. 16, T. 18 N., R. 16 W.
Selected by C. E. Resseguie.
Timber: hardwood mixed with hemlock.

Silica and Sand	75.27
Alumina	6.93
Oxide of Iron	6.10
Lime	1.00

Magnesia	.89
Potash	2.10
Soda	.90
Sulphuric Acid	.27
Phosphoric Acid	.30
Organic matter containing .09 Nitrogen	3.30
Water	2.92
Total Ash-food	5.46
Capacity for water	42.85

No. 17.—Lake City, Missaukee Co.

Selected by L. A. Barker.

Timber: beech, maple, elm, lynn, and some pine.

Sand and Silica	69.39
Alumina	8.35
Oxide of Iron	5.80
Lime	1.15
Magnesia	.98
Potash	1.95
Soda	1.15
Sulphuric Acid	.25
Phosphoric Acid	.28
Organic matter containing .11 Nitrogen	4.73
Water	5.38
Total Ash-food	5.76
Capacity for water	39.10

No. 18.—St. Louis, Gratiot Co.

Sec. 24, T. 12 N., R. 2 W.

Selected by S. S. Hastings.

Timber: cork-pine, beech, soft maple, oak, sassafras, etc.

Sand and Silica	88.54
Alumina	3.11
Oxide of Iron	2.15
Lime	.68
Magnesia	.30
Potash	.92
Soda	.26
Sulphuric Acid	.15
Phosphoric Acid	.14
Organic matter containing .06 Nitrogen	2.82
Water	.41
Total Ash-food	2.45
Capacity for water	38.40

No. 19.—Bay City, Bay Co.

Selected by Judge Marston.

Timber: not stated.

Sand and Silica	82.24
Alumina	4.60
Oxide of Iron	2.42
Lime	1.18
Magnesia	.46
Potash	1.18
Soda	.54
Sulphuric Acid	.20
Phosphoric Acid	.38
Organic matter containing .17 Nitrogen	5.57
Water and loss	.25
Total Ash-food	3.94
Capacity for water	47.30

No. 20.—Grand Traverse, Grand Traverse Co.

Sec. 11, T. 27 N., R. 11 W.

Selected by C. F. Davis.

Timber: beech, maple, ash, and rock elm.

Sand and Silica	88.65
Alumina	2.95
Oxide of Iron	2.60
Lime	1.37
Magnesia	.41
Potash	.89
Soda	.32
Sulphuric Acid	.14
Phosphoric Acid	.13
Organic matter containing .04 Nitrogen	2.05
Water	.49
Total Ash-food	3.26
Capacity for water	40.20

No. 21.—Greenville, Montcalm Co.

(No name, description, or kind of timber given.)

Sand and Silica	85.40
Alumina	4.50
Oxide of Iron	2.80
Lime	.82
Magnesia	.31
Potash	1.13
Soda	.45
Sulphuric Acid	.21
Phosphoric Acid	.20
Organic matter containing .10 Nitrogen	2.75
Water	1.43
Total Ash-food	3.12
Capacity for water	37.80

No. 22.—Colfax, Mecosta Co.

Selected by Fitch Phelps.

Timber: heavy pine forest.

Sand and Silica	75.54
Alumina	10.62
Oxide of Iron	3.80
Lime	.94
Magnesia	.48
Potash	1.96
Soda	1.25
Sulphuric Acid	.26
Phosphoric Acid	.44
Organic matter containing .12 Nitrogen	2.97
Water	1.44
Total Ash-food	5.33
Capacity for water	45.40

No. 23.—Benzonia, Benzie Co.

T. 26 N., R. 15 W.
Selected by C. L. Northrup.
Timber: beech, maple, elm, lynn, ash, cherry, etc.

Sand and Silica	90.08
Alumina	2.86
Oxide of Iron	1.50
Lime	.55
Magnesia	.27
Potash	1.10
Soda	.45
Sulphuric Acid	.18
Phosphoric Acid	.21
Organic matter containing .07 Nitrogen	2.45
Water	.35
Total Ash-food	2.76
Capacity for water	39.30

No. 24.—Gaylord, Otsego Co.

Sec. 8, T. 31 N., R. 3 W.
Selected by S. H. Crowl.
Timber: maple, beech, hemlock, lynn, etc.

Sand and Silica	91.92
Alumina	2.93
Oxide of Iron	.90
Lime	.40
Magnesia	.13
Potash	.61
Soda	.28
Sulphuric Acid	.10
Phosphoric Acid	.14
Organic matter containing .07 Nitrogen	2.20
Water and loss	.39
Total Ash-food	1.76
Capacity for water	40.70

No. 25.—Soil from Agricultural College.

Garden soil.
Selected by R. C. Kedzie.
Timber: oak, beech, maple, elm, cherry, and sassafras.

Sand and Silica	85.37
Alumina	4.53
Oxide of Iron	1.81
Lime	1.22
Magnesia	.59
Potash	.85
Soda	.37
Sulphuric Acid	.23
Phosphoric Acid	.30
Organic matter containing .16 Nitrogen	3.14
Water	1.55
Total Ash-food	3.56
Capacity for water	39.60

No. 26.—Soil from Agricultural College.

Vineyard.
Selected by R. C. Kedzie.
Timber: oak, maple, beech, and elm.

Sand and Silica	65.48
Alumina	15.60
Oxide of Iron	6.40
Lime	1.28
Magnesia	.89
Potash	2.12
Soda	1.16
Sulphuric Acid	.25
Phosphoric Acid	.41
Organic matter containing .11 Nitrogen	4.10
Water	2.28
Total Ash-food	6.11
Capacity for water	59.15

No. 27.—Soil from Agricultural College.

Field No. 8.
Selected by R. C. Kedzie.
Timber: oak, beech, maple.

Sand and Silica	74.65
Alumina	9.66
Oxide of Iron	4.18
Lime	1.46
Magnesia	.43
Potash	1.97
Soda	1.13
Sulphuric Acid	.26
Phosphoric Acid	.31
Organic matter containing .12 Nitrogen	4.66
Water	1.25
Total Ash-food	5.56
Capacity for water	43.50

No. 28.—Tawas, Iosco Co.

Sec. 15, T. 22 N., R. 7 E.
Selected by J. A. F. Scheffler.
Timber: hemlock, pine, beech, maple.

Sand and Silica	80.06
Alumina	7.15
Oxide of Iron	3.53
Lime	.93
Magnesia	.36
Potash	1.10
Soda	.38
Sulphuric Acid	.19
Phosphoric Acid	.16
Organic matter containing .09 Nitrogen	4.59
Water	.82
Total Ash-food	3.12
Capacity for water	63.80

No. 29.—Big Rapids, Mecosta Co.

Sec. 22, T. 15 N., R. 10 W.
Selected by G. W. Warren.
Timber: beech, maple, lynn, etc.

Sand and Silica	76.00
Alumina	10.00
Oxide of Iron	3.41
Lime	1.14
Magnesia	.49
Potash	1.80
Soda	1.16
Sulphuric Acid	.24
Phosphoric Acid	.33
Organic matter containing .10 Nitrogen	3.18
Water	1.90
Total Ash-food	5.16
Capacity for water	43.80

No. 30.—Sherman, Wexford Co.

Sec. 10, T. 23 N., R. 12 W.
Selected by H. D. Griswold.
Timber: maple, rock elm, lynn, beech, and a little hemlock.

Sand and Silica	86.74
Alumina	4.32
Oxide of Iron	2.10
Lime	.65
Magnesia	.24
Potash	.83
Soda	.34
Sulphuric Acid	.14
Phosphoric Acid	.15
Organic matter containing .11 Nitrogen	3.26
Water	.86
Total Ash-food	2.35
Capacity for water	44.00

No. 31.—Elk Rapids, Antrim Co.

Sec. 33, T. 29 N., R. 9 W.
Selected by Geo. E. Steele.
Timber: maple, lynn, elm, some hemlock and beech.

Sand and Silica	84.68
Alumina	4.82
Oxide of Iron	3.20
Lime	.95
Magnesia	.36
Potash	.98
Soda	.40
Sulphuric Acid	.16
Phosphoric Acid	.18
Organic matter containing .08 Nitrogen	3.14
Water	.65
Total Ash-food	3.03
Capacity for water	52.10

For the sake of comparison, the capacity for water (or the percentage of water the dry soil will hold), of the following soils, is introduced:

"Pine barrens" of New Jersey	25.60
"The plains," Baldwin	29.20
" " Walton Junction	30.40
" " Kalkaska	33.10

To any not familiar with agricultural chemistry such tables will appear very dry and uninteresting, or even unintelligible. I will try to give you some insight into their meaning. Looking at these tables you see that "sand and silica," "alumina" and "oxide of iron" make much the largest part of each soil. You are all familiar with sand. Silica and alumina, when chemically combined, form clay. Oxide of iron is the material which gives the reddish or brownish color to most soils. The great bulk of nearly all soils is made up of sand, clay and oxide of iron. Alumina is never found in the ash of cultivated plants; a certain amount of silica and oxide of iron is found in the ash of all plants; but the great mass of these materials, as found in the soil, is of no worth in the chemistry of plant life; they are the *mechanical agents of the soil,* and are of worth mainly from their relations to temperature and moisture and by giving mechanical support to the plants. Their chief office in the soil is physical, and not chemical. They render the soil light or heavy, porous or retentive. The organic matter of soils, besides furnishing a supply of combined nitrogen, is chiefly valuable for its physical relations to temperature, moisture and porosity of soils.

Leaving out of account the mechanical agents of the soil, which mainly influence the physical conditions of soils, there remain lime, magnesia, potash, soda, the sulphates and phosphates. While these substances make up the smaller part of all soils, they make up the larger part of the ash of all cultivated plants. They are necessary conditions of plant growth; in their absence no plant can grow; when they are present in very limited amount plant growth

is correspondingly limited, but when they are present in sufficient quantity and in available form, if the physical conditions of the soil and the climate are favorable, any crop can be grown and brought to perfect maturity. They are the *chemical agents of plant growth.* In the entire absence of either lime or magnesia, or potash, or sulphates, or phosphates, no plant can grow, much less mature its seed.

In studying the results of chemical analysis of the soil, we should fix our attention mainly upon these indispensable ash elements of plant growth. In the following table I omit the mechanical agents of the soil, and present only the sum of ash elements contained in one hundred parts of soil:

1. River Raisin bottom lands, cultivated forty years	7.17
2. River Raisin bottom lands, virgin soil	7.58
3. Burr-oak wheat land, Saline	4.33
4. Prairie soil, never plowed, Cass Co.	4.99
5. Prairie soil, cultivated 30 years, Cass Co.	3.98
6. Soil from South Haven	2.47
7. Gilmore, Isabella Co.	2.72
8. Warren, Midland Co.	2.94
9. Midland, Midland Co.	6.66
10. Sheridan, Clare Co.	1.55
11. Chase, Lake Co.	2.76
12. Grant, Clare Co.	5.37
13. Webber, Lake Co.	1.90
14. Evart, Osceola Co.	3.56
15. Eden, Mason Co.	1.98
16. Eden, Mason Co.	5.46
17. Lake City, Missaukee Co.	5.76
18. St. Louis, Gratiot Co.	2.45
19. Bay City, Bay Co.	3.94
20. Grand Traverse, Grand Traverse Co.	3.26
21. Greenville, Montcalm Co.	3.12
22. Colfax, Mecosta Co.	5.33
23. Benzonia, Benzie Co.	2.76
24. Gaylord, Otsego Co.	1.76
25. Agricultural College garden	3.56
26. Agricultural College vineyard	6.11
27. Agricultural College field No. 8	5.56
28. Tawas, Iosco Co.	3.12
29. Big Rapids, Mecosta Co.	5.16
30. Sherman, Wexford Co.	2.35
31. Elk Rapids, Antrim Co.	3.03

If we reject from this list the exceptionally rich bottom lands of the Raisin (1 and 2), and of the Tittabawassee (9), and the exceptionally poor land (10, 13, 15 and 24), taking the average of the burr-oak land of Washtenaw county and the prairie soils of Cass county as a basis of comparison (4.43), we find that the average of all the rest of the soils in this list differs from this high standard of soil excellence by only 58 hundredths of one per cent. All the soils of this list (with the four exceptions) contain a large excess of ash elements beyond the requirement of any crop that may grow upon it. Soil No. 1 from River Raisin bottoms, has been cultivated forty years without manure, yet, in 1876, it produced 83 bushels of shelled corn to the acre.

In the case of the four exceptional soils, while the relative amount of ash materials seems small, the absolute amount to the acre is large. Take No. 10, which is the lowest in the list, having only 1.55 per cent of ash elements; fix your eye upon potash .54 and phosphoric acid .15 per cent, these substances being most important in the production of cereal crops; we find that an acre of this soil taken to the depth of 12 inches, contains 10,800 pounds of potash and 4,000 pounds of phosphoric acid; yet 30 bushels of wheat remove less than 22 pounds of potash and 34 pounds of phosphoric acid. It will thus be seen that even the poorest of these soils cannot be called chemically barren, because they contain all the necessary ash elements of plants and in quantities sufficient to sustain remunerative crops. If they are unfruitful it must be because of unfavorable physical conditions, or because the ash elements are not in an available form.

RELATION OF THE SOIL TO WATER.

One prime condition of vegetable growth is water. No matter what the chemical composition of a soil, or what its physical properties, nothing can

grow upon it in the absence of water. So controlling is its influence that the Bible often speaks of an unfailing supply of water as the leading condition of vegetable growth. "And he shall be like a tree planted by the rivers of water, and bringeth forth his fruit in his season; his leaf also shall not wither; whatsoever he doeth shall prosper." The "Great Sahara" is a desert not from any peculiarity of the soil but mainly from want of water. This imperative need of water to sustain vegetable life is not confined to tropical regions, but is felt through every zone of cultivation. Even where water is present in sufficient quantity to sustain life we find that fruitfulness is increased by abundant and well distributed rains. A dry year means *short crops* in temperate climates and *famine* in tropical climes.

The relations of the water of the soil to the production of crops may be considered under three heads: 1, The amount and distribution of rain; 2, Capacity of the soil to retain water; 3, The approach of the water line to the surface of the soil.

1. *Rainfall.*—If we could obtain reliable statistics of the amount of rainfall in these new counties, and of the distribution of the rain through the months of the year, they would furnish one very valuable means of determining their agricultural capabilities; but such statistics are almost entirely wanting.

2. *Capacity to hold water.*—The power of soils to take up and retain moisture bears an important relation to their fertility, because this capacity to imbibe and hold water is one very important condition of their withstanding the influence of prolonged absence of rain. Soils differ greatly from each other in this respect; in the same district and under the same conditions in regard to rainfall we find that one soil will withstand the influence of dry weather and keep its crops green and vigorous, while the crops on a neighboring soil will be parched and burned under the same conditions of weather.

The capacity of a soil to hold water is influenced both by its chemical composition and by the fineness of its division. Humus, or the vegetable matter of the soil, will retain the most water. Clay and the oxide of iron found in soils stand next, while sand stands lowest in the list. The more finely a soil is divided the more water it will hold; one hundred parts of carbonate of lime in the form of sand will only hold twenty-nine parts of water, but in the form of fine powder will hold eighty-five parts, or nearly three times as much as the coarse material.

I have examined these Michigan soils with reference to their capacity to hold water, regarding this as one very important criterion by which to pronounce upon their agricultural capabilities. I thus aim to make the soils tell their own story, while I merely act as interpreter in this respect. The soils were dried at 212 degrees Fahrenheit till they ceased to lose weight; all stones and roots were picked out and all lumps broken down, but the soils were not pulverized or reduced to a finer state of division than was found in their natural state. One hundred grammes of the soil were weighed out, placed in a tared glass funnel, and water poured over the soil till it was completely wet, but the soil was not stirred or puddled in the least; it was allowed to stand till the water ceased to drop, when the weight was again determined; the increase in weight showed the amount of water one hundred parts of thoroughly air-dry soil would take up and hold. This shows the relative capacity of these soils to take up and hold under natural conditions the water which falls upon them in the form of rain or snow, and thus shows their relative resources against periods of impending drought. For purposes of comparison I include in this list soil from "the

pine barrens" of New Jersey and from "the plains" of Kalkaska, Baldwin and Walton Junction.

WATER HOLDING CAPACITY OF ONE HUNDRED PARTS OF VARIOUS SOILS.

Pine barrens of New Jersey	25.60	15	32.40
The plains, Baldwin	29.20	16	42.85
The plains, Walton Junction	30.40	17	39.10
The plains, Kalkaska	33.10	18	38.40
1	65.60	19	47.30
2	61.20	20	40.20
3	36.30	21	37.80
4	73.20	22	45.40
5	50.55	23	39.30
6	44.70	24	40.70
7	49.60	25	39.60
8	51.15	26	59.15
9	51.40	27	43.20
10	43.10	28	63.80
11	45.65	29	43.80
12	44.90	30	34.00
13	35.30	31	52.10
14	45.80		

It seems to me that such an examination of soils with reference to their waterholding capacity is valuable because we interfere so little with the natural condition of the soil—we only deprive it of its free water, let it drink up all it will hold and then determine its amount. The results are very instructive and significant. The soil of the sterile pine barrens of New Jersey stands lowest in this list, taking up only 25.60 per cent. of water; then follow in order "the plains" of Baldwin 29.20, of Walton Junction 30.40, Eden 32.40, Kalkaska 33.10, and Webber 35.30. These soils are characterized by a deficiency of organic matter except the soil of Kalkaska. On the other hand the soils in the whole list which contain the most organic matter also have the greatest capacity to hold water; for example the prairie soils of Cass county, and the River Raisin bottom lands, that will hold from 61 to 73 per cent. of water, contain from 7.50 to 12.30 per cent. of organic matter.

Mr. Rockafellow, of Clare, told me that they found this difficulty in clearing up the lands along the banks of the Tobacco River, that "when the sandy lands are burned over in a dry time the life seems to be burned out of the soil, and some years pass before the land recovers its former fertility." The evil is doubtless caused by burning out much of the vegetable matter of the soil, which is again accumulated only after the lapse of some years. It seems to me that one important part in the management of such lands is to preserve the organic matter in the soil, or even to increase the humus by judicious green manuring.

On looking over the thirty-one soils which have been analyzed, and comparing the mass of these northern counties with those in the southern part of the State in the matter of their capacity to hold water, we find no evidence brought out by this test, which would lead us to question the agricultural capabilities of the mass of soil in these counties. Compare these lands with the wonderful wheat lands, the burr-oak plains of Washtenaw county, and you observe that only two out of the thirty-one specimens analyzed fall below the burr-oak lands in their capacity to imbibe and retain water.

3. *The water line.*—If we dig down in the ground we usually find a level in which water is present in such quantity that it will flow into the hole. The highest level in the soil in which water will flow is called the water line. It is

not a fixed level, but fluctuates with the season. Some call the surface of the water in a well the water line, but there may be levels above the well water which will afford flowing water, but not in sufficient quantity to permanently raise the level of water in the well, in which case the water line would obviously be above the water level in the well.

The physical condition of a soil will be greatly affected by fluctuations in the water line; when it comes very near the surface we have a swamp; when it is only one to two feet from the surface, coarse wild grasses or sedges predominate; when it is from four to ten feet from the surface we have the best conditions of fertility. It is to lower the water-line that the farmer resorts to tile-draining, the benefits of which are too well known to be dwelt on here.

Plants derive most of their water from the capillary water of the soil—water held by capillary attraction, that makes the soil moist but will not flow out of the soil by the force of gravity. But it is found that most plants under favorable circumstances will send a few roots as water-feeders to the free water in the soil in order to provide a supply when capillary water is deficient; thus beets, turnips, and many kinds of trees will often throw such quantities of roots into tile drains as to obstruct them entirely. It is often found that the roots of plants will extend to surprizing depths to reach the water-line to secure the means for this provisional supply of water. It is obvious that the plant will be in a better condition when the water-line is within a moderate distance from the surface.

In passing through the State from Saginaw to Ludington on the Flint and Pere Marquette railway, from all that I could learn the wells are from fifteen to thirty feet deep, showing that the water-line is within reasonable distance from the surface. In passing north on Grand Rapids and Indiana railway to Petoskey I found some circumscribed districts covered with a magnificent growth of maple, where the wells are from seventy-five to one hundred feet deep. At Mancelona I was told the well was seventy-five feet deep, and the same at Alba. Judging from the large pile of grayish white sand which I saw near the well at several places along the road I concluded that the soil from surface to bottom of the well is non-coherent sand. I was informed that well-diggers found no layers of clay in this peculiar formation, and often have to curb the well walls from top to bottom to prevent caving.

A soil of caving sand has little power to hold water unless it contains vegetable mould. In these peculiar districts the water line lies very deep—so deep that the hygienist would rub his hands for joy to find a region where the water line is so deep that malaria is impossible and where the foundation is knocked out from under consumption—but so deep that no water-feeding roots of any grain can ever reach it. While visiting this curious formation around Mancelona and in certain parts of Wexford county, the question continually came up in my mind, Will these heavily-wooded lands bear grain crops? Are the rains so abundant and so well distributed that cereals will be provided with enough water for vigorous growth? It may be answered that trees require water, and that they get a sufficient supply is proved by the heavy forest growth. But the tree is a conservative character; its life stretches out into centuries; it is never in a hurry; its yearly growth is from earliest leafage to final frosts; it takes the average of the year and of the years; it has time to send its roots deep and wide in search of moisture; if drought comes it has time to wait; if an unfavorable year comes it can put over very active growth and wait for better times. It is like a prudent farmer in hard times: it has only to live and wait.

Not so with the cereal; one year must round out its life with success or fail-

ure; like the merchant and business man, for it pay day comes and inevitable bankruptcy unless payment is made at the time. No matter how good an indorser is offered, Nature never renews a bank note for annual crops. Frost and drought are never accepted as pleas for an extension in Nature's banking house. "What thou doest do quickly," is nature's mandate to the cereal.

DIVERSITY OF SOILS.

Do not suppose that the northern counties are all made up of caving sands. The numerous lakes and streams show a sufficiently tenacious soil; it is only in isolated spots that I found this curious sand formation. Nor would I undertake to say that these caving sands may not produce good crops. I only call attention to these peculiar sands to draw out information which I was unable to obtain during my hasty trip through the country. The real test must be the result of cultivation of the soil, and a bushel of wheat raised on this soil is worth more than a straw stack of scientific guess raised elsewhere.

I found in this northland a great diversity of soil; for example, in some parts of Isabella and nearly all parts of Mecosta county (No. 22 and 29), I found the same boulder clay which is so characteristic of the strong and enduring soil of the north part of Eaton and south part of Ionia county, a soil that naturally clothes itself with a strong sod of June grass or white clover. In other places, for example Lake and the eastern half of Mason county (No. 11, 13 and 15), the soil is sandy and but little tendency is manifested to form a sod; the roadside of the railway was covered with creeping blackberry, like certain soil I have seen in some parts of Van Buren county. In other places, as in Midland county (No. 8) the soil is sandy, but it turfs over easily where hay seed has been scattered. John Reardon, of Coleman, told me that he had cut four or five tons of hay last summer from last winter lumber roads, these roads having been seeded by the hay drawn over them during last winter. No farmer need question the virtue of any soil that with instinctive modesty covers its nakedness with a robe of grass. When I speak of grass I do not include the sedges like the "bunch-grass" which usually grows upon very poor soil.

In some places, such as the vicinity of Baldwin, Walton Junction and Kalkaska, the soil is very sandy and the vegetation is mainly brake, sweet fern, dwarf huckleberry and bunch grass. These soils have a very unpromising look; but we soon pass from these weary sands to rich loams and strong clays which will make the husbandman's heart sing for joy.

It would seem unnecessary to point out the fact that the soil of this State often passes by abrupt transitions from one kind of soil to a very different kind. No prudent man desiring a given kind of soil will buy a farm "*unsight and unseen,*" as boys trade jackknives, but will carefully examine the soil to see if it be the kind he seeks. For one kind of farming he desires a strong clay, for another he wants a quick and warm sand. The great variety of soils found in our State seems to show that nature designed it for a widely diversified industry.

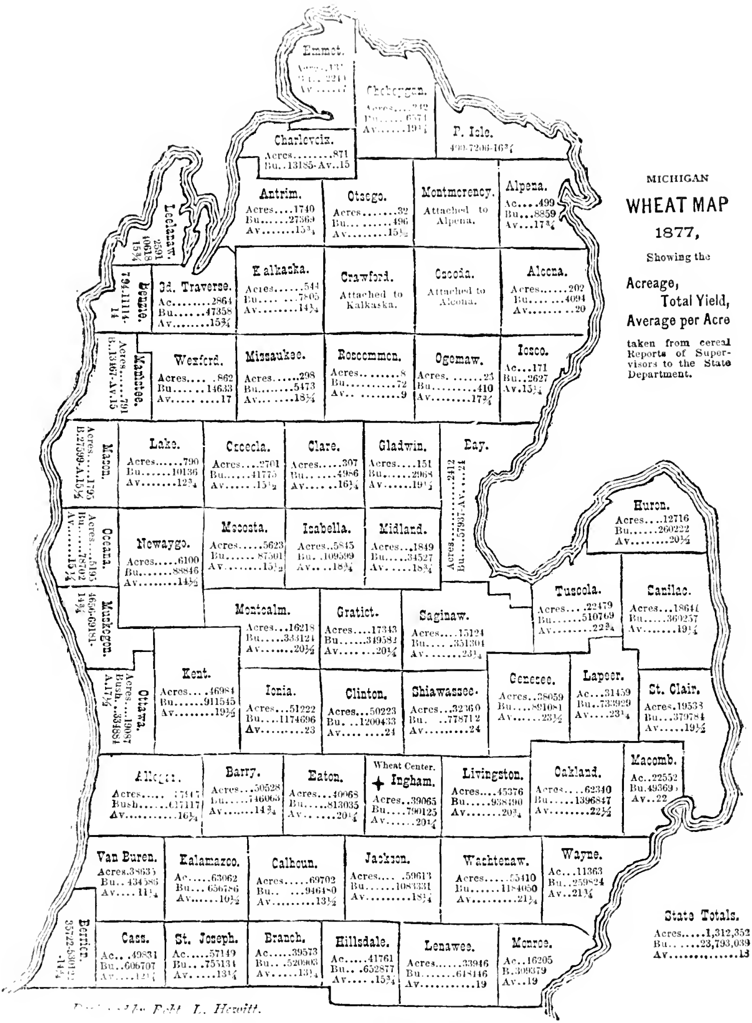
"THE WHEAT BELT."

In former years there was quite a rivalry between the different tiers of counties in the southern part of our State to know which was "the wheat belt." The State Department has prepared a very valuable wheat map of Michigan, in which are exhibited the number of acres, the total production and the average number of bushels of wheat to the acre for every county in the State for each of the years 1876 and 1877. The center of wheat production

has been steadily marching northward for many years, and according to this map the wheat center in 1877 was in Ingham county. No one supposes that it will stop there permanently; it is already in the third tier of counties, and its face is turned northward still. In ten years it will cross the line of the Detroit & Milwaukee railroad, and in less than twenty-five years it will be in Isabella county. Michigan has no wheat belt, because she is made for a broad wheat field from Hillsdale to the Straits of Mackinaw. Every part of the State is adapted to wheat raising, but especially the northern part, as is shown by the high average production in northern counties.

One reason why I think the production of wheat will rapidly extend to our northern counties is that wheat-raising on the large scale, where it is made an objective crop in distinction from its subordinate position in a rotation of crops, must be confined to cheap lands. Wheat will continue to be raised in our southern counties in a system of rotation and for home consumption, but the day is passing by when it will there be raised on the large scale for export, because the high price of lands forbids competition with low-priced lands which are equally productive, and which secure low rates of transportation by reason of through rates of railroad transportation. The farmers of southern Michigan may just as well look this subject squarely in the face, because the sooner they comprehend the matter and adapt their system of farming to it, the better for their future history. Take the southern tier of counties from Monroe to Berrien; the arable land of this belt is worth $75 an acre. Call the interest on this 7 per cent. and the taxes 1 per cent.; this would place the annual value of the land at $6 an acre. The cost of raising and marketing an acre of wheat I place at $10. The cost of an acre of wheat in this belt is $16. The average yield in this belt for 1877 was 15.31 bushels per acre. To make neither profit nor loss but only to save himself on his wheat, the farmer must sell his wheat for $1.04½ a bushel. Now take the sixth and seventh tier of counties, Mason, Lake, Osceola, Clare, Gladwin, Oceana, Newaygo, Mecosta, Isabella, Midland and Bay; call the land worth $25 an acre, the interest and taxes the same as in the first tier of counties, and the cost of raising and marketing an acre of wheat $10, as before; the annual rental of the land would be $2, and the cost of an acre of wheat in market would be $12. The average production of this belt of counties in 1877 was 16.93 bushels. The average farmer in this region could sell his wheat without any loss at 71 cents a bushel. I need not say to you that the man who can afford to sell his wheat for 71 cents will, in the long run, drive to the wall the man who must have $1.04½. Wheat raising on the large scale will as inevitably gravitate to cheap lands as water will run down hill. Such considerations lead me to predict that the wheat center of our State within twenty-five years will reach the line of the Flint & Pere Marquette railroad.

Have you ever considered the leveling influence of railroads and other means of cheap and rapid transportation on the price of farm lands? Low priced lands are levelled up, but high priced lands are raked down without mercy. In the grain market of the world, by means of cheap transportation, we come in competition with the grain raisers of England, France, Austria, Russia and Egypt, but in the same market we also come in compeitition with the wheat growers of Iowa, Kansas and California, and in the crowded halls of the world's great board of trade the lowest bidder always carries off the prize. In this struggle to hold the world's market by selling wheat cheap, the owner of high priced land "gets the hot end of the poker" every time in his rivalry with the owner of cheap lands who can command cheap transportation.



WHEAT MAP OF MICHIGAN.

Do you realize that cheap grain and cheap meat have brought British agriculture to the verge of bankruptcy? We are bringing distress and ruin upon England by the very abundance and cheapness of our means of living which we offer them. This is a new and startling rendering of the old command, "If thine enemy hunger, feed him; if he be thirsty, give him drink; for in so doing thou shalt heap coals of fire on his head."

The farmer must study these problems of the relations of production and cheap transportation to universal competition if he would not be ground to powder between the upper and the nether millstones of over production and unlimited competition. Do you say that such reasoning would lead long-sighted calculators to sell their high-priced farms before further depreciation and buy and improve cheap farm lands before the rise comes? I would hardly undertake to deny the correctness of such an inference, but what a tide of immigration would this send to our northern counties!

HEALTH-SEEKERS, OR HEALTH-OWNERS?

Here is a vast region of wonderful beauty, where health and healing fill earth and air—a land waiting for the husbandman to "tickle it with a hoe that it may laugh with a harvest." Yet for some incomprehensible reason emigration seems to avoid it, and farmers wander elsewhere from Halifax to Texas in search of farm lands. The handful of population it has acquired has been drawn thither by lumbering rather than farming interests. The history of many a settler was given by a member of the legislature in a recent conversation: "We went there to lumber, and then to quit; we had no more thought of farming than of flying. We put in a few vegetables in the cleared space around our lumber camps, and the yield was so remarkable that we cleared off a small field and put it into grain, when the harvest was so wonderful that before we knew it we were farming. We knew the country was good for lumber, we found that it was better for farming. That's the way Sanilac county was settled. Here is my friend the representative from Huron county, who will tell you the same story for his county."

In my hurried trip through this northland last September, the present condition and future possibilities of this region continually pressed upon my mind. As I rode through these vast forests and breathed in the wonderfully invigorating air; as I passed here a company of lumbermen and there a hunter with his gun or the angler with his rod; as I confronted the hollow-eyed and pale-cheeked seeker for health, the question came continually into my mind, shall this wonderful and beautiful northland for all time be given up to the hunter, the lumberman and the health-seeker, or shall the *health owner* take possession of these murmuring solitudes and fill them with happy homes and prosperous, fruitful fields, the abodes of health, plenty and content? If he is a benefactor who causes two blades of grass to grow where but one grew before, much more is he a *well-worker* who shall plant healthy and happy homes where now is naught but the wildness and savagery of nature.

THE COMPARATIVE FOOD-VALUE OF CERTAIN VARIETIES OF INDIAN CORN RAISED IN MICHIGAN, AND OF CERTAIN MILLSTUFFS.

BY R. C. KEDZIE.

[Lectures read at the Farmers' Institutes held at Dowagiac and Bay City.]

In the Farmers' Institute held at Paw Paw last winter, a question arose in regard to the fattening properties of different varieties of Indian corn, when fed to swine, and the wish was then expressed that I would analyize the different varieties of corn raised in our State, and furnish farmers with some means of estimating the food-value of our leading varieties of corn.

By the kindness of David Woodman 2d, and others, I obtained thirteen specimens of corn, which were analyzed, and the corn with the results of analysis was exhibited at the State Fair in Detroit.

A few weeks ago I received the following letter from the Master of the State Grange:

PAW PAW, December 20th, 1878.

Dr. R. C. Kedzie:

DEAR SIR—As our farmers are not all practical chemists, and do not fully understand the relative value of the ingredients of which corn is composed, for fattening purposes, you will confer a favor by answering the following questions as supplementary to your analysis of corn:

1. Did the condition of the corn as to *dryness* have anything to do with the amount of "water" found in the samples analyzed?

2. What is the relative value of the different ingredients or elements of which corn is composed for *fattening purposes?*

3. What is the relative value of "White Dent" in the samples analyzed for *fattentening purposes*, as compared with the other varieties analyzed?

By answering the above questions you will confer a favor.

Yours very truly, J. J. WOODMAN.

These are important subjects for the consideration of farmers, and the chemical analysis of these varieties of corn is mainly of value by enabling us to satisfactorily consider these and similar questions.

In entering upon this subject I concluded it would be well to include the various mill-products used as food for animals, and to compare these with the various kinds of corn in estimating the food-value. I have not limited myself to the fattening properties of these materials, but I aim to also make some estimate of their food-value to the growing, the working, as well as the fattening animal.

In estimating the value of any complex substance it is a good plan to separate from it anything which has little or no value for the use proposed. We thus separate the wheat from the chaff, and are able to make a more satisfactory estimate of both the wheat and the chaff by reason of this separation. In looking at the table of analysis of the corn, you see that certain substances appear in them all which have little or no direct value as food; or they may be present in such quantity as to be in excess of the demands of any animal consuming these food materials.

WATER.

Water appears in somewhat large amount in all these substances, but the amount varies somewhat in them all. The water present in these food mate-

rials, by rendering them softer and more easily masticated, or more palatable, may make them more easily digestible, and may thus have an indirect value. Yet, *as a food,* it is of no more value than the same amount of water in the watering-trough. We shall get a better estimate of the real value as food, of any substance by leaving out the water in our statement of food-value.

In reply to Mr. Woodman's question, I would say, that all the corn and the mill stuffs seemed to be equally dry; any person examining them would say that they were all dry and in good condition. Many substances will hold a considerabe amount of water while appearing to be dry; yet if heated for some time to 212° F., they will give off water, as is shown by their losing weight for a time. When an organic substance ceases to lose weight at the temperature of 212° F., it is regarded as really dry; and this loss of weight represents the amount of water present. Substances differ in their power to hold water in this concealed form; and thus corns apparently dry may vary in the amount of water they hold.

CELLULOSE.

In each analysis there is an amount, varying in each instance, of cellulose or woody fibre. In grain the cellulose is found chiefly in the tough envelope of the seed, and when the grain is ground, the most of the cellulose reappears in the bran and other coarse products separated by the bolt. It is claimed that a certain amount of this woody fibre is digested under favorable conditions, but the amount that is digested is a variable one, and under ordinary conditions the most of the cellulose passes off in the excretions, especially if the animal is fed with abundance of rich food as in fattening. In the feeding of store animals it becomes an object to secure the digestion of cellulose, —a matter to which I will call your attention further on—but this cellulose may be obtained at so small a cost in the form of straw, that it is a material of comparatively no value in the more costly forms (grain) of animal food. I therefore omit cellulose in making up the actual food value of corn.

ASH.

In each analysis a certain small amount appears as "ash;" it varies in amount, in corns, from 1.28 to 1.60 per cent; in some of the millstuffs the amount of ash is more than twice as much as the largest amount in the corn. Some of this ash is unquestionably of value in animal nutrition, and vigorous health could not be maintained if the ash elements were entirely withdrawn from food. From this ash of food comes the mineral matter which makes the bones of the animal, and in the growing animal the ash of the food is an important matter. The same is true whenever bony matter must be rapidly formed. A cow broke her leg, and during the time the bone was reuniting it was found that her milk was almost entirely destitute of phosphate of lime. The cow wisely concluded to place the phosphate where it "would do the most good."

All of these specimens of corn and millstuffs contain enough of this mineral food, and some of them more than is required to sustain the vigorous health of any animal. The amount taken up by an animal will vary according to the amount of bony substance it is forming, but the amount taken up daily by any animal, and especially when fattening, is very small. I throw out the ash therefore in making up my estimate of the actual food-value of these various substances.

ACTUAL FOOD.

Food is any substance by which all the functions and powers of the body may be continuously supported—that by which an animal may *live, grow and work.* The food of an animal must obviously be of the same composition as the materials of the body, or be capable of transformation into substances of identical composition; for in this way only can it build up the animal system, or repair its incessant waste. Again, only that portion of the food which is digested affords value as food: the part which remains undigested, no matter what its composition, or how capable of sustaining life, fails utterly as food; it is cast out of the body in the excretions and may thus realize some profit as manure, but it is wasted as food.

By rejecting the *water*, *cellulose*, and *ash*, found in the results or table of analysis, we have left the materials which are *capable of complete digestion in the animal system*, which are unquestionably of the highest value for animal food. These are made up of two classes of substances; one containing only carbon, hydrogen, and oxygen, and hence called *carbohydrates*; the other containing nitrogen in addition; this last class of substances is called *albuminoids*, from the general resemblance to albumen or white of eggs. Since the muscles of animals have almost identically the same composition as albumen, the albuminoids in food may be called the *flesh-formers*, while the carbohydrates, such as starch, sugar, gum, and fat, may be called the *force-formers*. In the animal body we find both these classes of substances, the albuminoids as muscles and tissues, and the carbohydrates chiefly as fat. A complete food therefore requires the presence of both the albuminoids and the carbohydrates: an animal will starve when fed on only one of these classes for any long period. You may say that a dog will live on meat for an indefinite time: but meat contains layers of fat, and even lean meat is found to contain small globules of fat scattered throughout its substance. If you will cut across the fibres of a very dry piece of "dried-beef," and examine the cut surface you will see evidence of the presence of fat. Repeated experiments have shown that an animal fed exclusively on pure albumen, or pure fibrin will starve just as certainly as when fed on pure sugar or fat. Boussingault of France fed a duck on butter only, and although it was "as fat as butter," the duck starved to death: the butter exuded from all parts of the body, and the feathers appeared as if they had been soaked in melted butter, yet the duck died of starvation.

In nature these two classes of substances are always found united; the albuminoids are always associated with some form of carbohydrates, and the carbohydrates are always naturally associated with some form of albuminous matters. We never find these substances in an entirely separate form, unless they have been separated by some artificial process.

RELATIVE VALUE OF ALBUMINOIDS AND CARBOHYDRATES

Since an animal cannot be kept in a healthy condition without both albuminoids and carbohydrates, it is useless to ask which is the most valuable for food, because the value is relative in both cases. It would be as sensible to ask which is of most use in a watch, the main-spring or the hair-spring. Any watch-maker will tell you that neither is valuable in a watch without the other: a watch will not go without the mainspring, and the same is true if the hair-spring is gone. Each class of food will be valueless in the entire absence of the other and in this sense they are of equal value. Yet they have very different uses in the body; the albuminoids serve to build and repair the waste of the muscular

and nervous systems, while the carbohydrates maintain the animal heat, and serve as a storehouse of force to sustain the working animal. The requirements of an animal in regard to one or other class of food will depend upon its condition; if growing and forming muscular tissue, or if in milk, and thus parting with albuminoids in the cheesy matter of milk, it will require a relatively large amount of albuminoids; if at work, it will require more of carbohydrates as well as albuminoids.

As all animal force is manifested through muscular contraction, it was supposed that every contraction of the muscles must be attended by a corresponding waste of the muscles, and as the albuminoids are directly concerned in repairing the waste of the muscular system, it was supposed that the albuminoids emphatically represented the force-forming elements in food, and physiologists formerly attempted to measure the labor-value of food by the amount of albuminoids present, and the amount of work done by any animal by the quantity of nitrogen excreted. It puzzled the physiologist to explain how laboring men could perform so much work on fat pork, and especially, how they could consume so much fat in mild weather, when no addition to the animal heat was required, since they supposed that the only office of fat was to develop heat. Yet these workmen would live and labor in spite of the plainest laws of physiology! The explanation offered was that the laborer had become accustomed to eat fat pork in cold weather when it was required to keep up the animal temperature, that from force of habit he continued to eat it in warm weather when it was not needed, and that his strong constitution and open-air life enabled him to violate the plainest laws of physiology without any immediate disaster, but the fat could be of no service except to keep up the animal heat. But the workman was wiser than his teacher, and instinct led him to better conclusions than the dogmatic assertions of theoretical science. Within a few years past very careful experiments have shown that work is not attended by a corresponding waste of the muscular system, but is attended by a largely increased consumption of carbohydrates, such as fat, sugar, and starch; that there is a marked increase in the amount of carbonic acid thrown out of the system, but no marked increase in the excretion of nitrogen in the form of urea. The comparison is made of the muscular system to the steam engine, and the carbohydrates to the fuel whose combustion generates the steam which gives force in the engine; a certain amount of force in the engine requires the consumption of a definite amount of fuel; if the engine is kept in good repair, the amount of force which it can exert may be measured by the amount of fuel it consumes; just so the performance of a certain amount of work by an animal requires the consumption of a certain amount of food—of albuminoids, to keep the muscular engine in good repair, and of carbohydrates, to furnish the force to run the engine.

FORCE-VALUE.

Different kinds of fuel have marked difference in the amount of heat they will produce when burned; a hundred pounds of charcoal will make more steam than a hundred pounds of dry wood, because even the driest wood is made up of about equal parts of carbon, hydrogen, and oxygen, united in proportions to form water, *i. e.*, the wood is made up of equal weights of carbon and water, chemically combined. The charcoal is made up almost entirely of unburned material or carbon, while perfectly dry wood contains only half its weight of unburned materials. We may say that the charcoal contains the heat-forming material in a more condensed form than the wood.

We find the same difference in the force-forming nature of different food-materials. In sugar and starch we find carbon united with hydrogen and oxygen, in very much the same way as in wood, and it is only the carbon part which gives force. In fat we find the carbon combined with hydrogen and only a very small part of oxygen, so that both the carbon and hydrogen are almost entirely in the unoxidized form, and hence capable of producing an increased amount of force as compared with the same weight of sugar or starch. (C_{12} H_{22} O_{11}=sugar. C_{10} H_{18} O=fat.) One pound of fat is found to be capable of producing as much heat when burned as two and a half pounds of sugar or starch, and hence the force-forming power of fat whether burned outside the body or oxydized within it, is estimated at $2\frac{1}{2}$ times that of sugar or starch. On the other hand the theoretical value of sugar and starch is nearly the same, and the elaborate experiments of Lawes and Gilbert show that these substances have very nearly the same value in animal nutrition. The quantity of oxygen required to oxidize 100 parts of fat is 293, of starch 120, and of grape sugar 106, and the quantity of heat or force which they would produce would be in the same proportion; their heat-forming and their force-forming power are in the same proportion. The steam generated in a boiler may be used to warm a building or drive an engine, or a part of the steam may be used for warming and the rest for work. Just so in the animal economy, a part of the force of the carbohydrates is used to warm the animal and the balance to do his work of every kind.

Let us turn from this theoretical discussion to the consideration of the nature of the food-materials which we have come together to consider. I present

THE TABLES OF ANALYSIS

Of Indian Corns raised in Michigan in 1877, and of various grades of Mill-stuffs obtained in Lansing,—the whole analyzed in the Laboratory of the State Agricultural College:

No. 1.—Yellow Dent.

Raised by D. Woodman, 2d, Paw Paw.	
Water	12.74
Albuminoids	11.75
Starch	59.47
Fat	4.63
Sugar	2.64
Gum	4.87
Cellulose (woody fibre)	2.49
Ash	1.41
Flesh-formers	11.75
Force-formers	73.92
Total food-value	85.67

No. 2.—Yellow Dent.

Raised by Geo. H. Kedzie, Deerfield.	
Water	11.66
Albuminoids	11.48
Starch	62.00
Fat	5.07
Sugar	2.84
Gum	2.96
Cellulose (woody fibre)	2.48
Ash	1.51
Flesh-formers	11.48
Force-formers	75.40
Total food-value	86.88

No. 3.—White Dent.

Raised by D. Woodman, 2d, Paw Paw.	
Water	13.73
Albuminoids	11.52
Starch	58.05
Fat	4.63
Sugar	3.04
Gum	5.17
Cellulose (woody fibre)	2.26
Ash	1.60
Flesh-formers	11.52
Force-formers	73.20
Total food-value	84.72

No. 4.—Hackberry Dent.

From Paw Paw, Mich.	
Water	12.47
Albuminoids	9.88
Starch	61.81
Fat	4.77
Sugar	3.59
Gum	3.71
Cellulose (woody fibre)	2.30
Ash	1.47
Flesh-formers	9.88
Force-formers	76.26
Total food-value	86.14

No. 5.—Strawberry Roan.

Raised by D. Woodman, 2d, Paw Paw.

Water	14.05
Albuminoids	10.31
Starch	62.92
Fat	4.59
Sugar	2.53
Gum	2.18
Cellulose (woody fibre)	2.03
Ash	1.39
Flesh-formers	10.31
Force-formers	74.51
Total food-value	84.82

No. 6.—White-Oil Corn.

Raised by Charles Joslyn, Indianapolis, Ind.

Water	11.29
Albuminoids	10.50
Starch	62.94
Fat	4.87
Sugar	3.00
Gum	4.22
Cellulose (woody fibre)	1.90
Ash	1.28
Flesh-formers	10.50
Force-formers	77.46
Total food-value	87.96

No. 7.—Pony Dent.

Agricultural College.

Water	13.42
Albuminoids	11.25
Starch	59.25
Fat	4.83
Sugar	2.31
Gum	5.38
Cellulose (woody fibre)	2.16
Ash	1.40
Flesh-formers	11.25
Force-formers	74.18
Total food-value	85.43

No. 8.—Pony Dent.

Raised by D. Woodman, 2d, Paw Paw.

Water	13.29
Albuminoids	10.63
Starch	60.11
Fat	5.03
Sugar	2.37
Gum	5.05
Cellulose (woody fibre)	2.21
Ash	1.31
Flesh-formers	10.63
Force-formers	75.07
Total food-value	85.70

No. 9.—Tuscarora.

Raised by D. Woodman, 2d, Paw Paw.

Water	14.08
Albuminoids	10.86
Starch	62.85
Fat	5.77
Sugar	1.68
Gum	1.44
Cellulose (woody fibre)	1.80
Ash	1.52
Flesh-formers	10.82
Force-formers	74.66
Total food-value	85.48

No. 10.—Smut-Nose.

Raised by D. Woodman, 2d, Paw Paw.

Water	12.90
Albuminoids	11.81
Starch	59.98
Fat	4.94
Sugar	3.78
Gum	3.05
Cellulose (woody fibre)	2.00
Ash	1.54
Flesh-formers	11.81
Force-formers	74.22
Total food-value	86.03

No. 11.—Smut-Nose.

Agricultural College.

Water	13.26
Albuminoids	11.51
Starch	61.35
Fat	5.14
Sugar	2.47
Gum	2.29
Cellulose (woody fibre)	2.49
Ash	1.49
Flesh-formers	11.51
Force-formers	73.82
Total food-value	85.33

No. 12.—Eight-Rowed Flint.

Raised by D. Woodman, 2d, Paw Paw

Water	13.45
Albuminoids	12.00
Starch	57.47
Fat	4.83
Sugar	2.40
Gum	6.16
Cellulose (woody fibre)	2.26
Ash	1.4
Flesh-formers	12.00
Force-formers	73.27
Total food-value	85.27

No. 13.—SANFORD CORN.

Raised by D. Woodman, 2d, Paw Paw.

Water	13.37
Albuminoids	10.69
Starch	63.50
Fat	5.06
Sugar	2.70
Gum	1.21
Cellulose (woody fibre)	2.10
Ash	1.37
Flesh-formers	10.69
Force-formers	75.00
Total food-value	85.69

MILLSTUFFS.

1.—*Bran.*

Water	11.65
Albuminoids	14.00
Carbohydrates	55.56
Fat	4.03
Cellulose	9.13
Ash	5.63
Flesh-formers	14.00
Force-formers	61.60
Total food-value	75.60

2.—*Shorts.*

Water	11.26
Albuminoids	15.13
Carbohydrates	57.35
Fat	4.85
Cellulose	7.46
Ash	3.95
Flesh-formers	15.13
Force-formers	65.62
Total food-value	80.75

3.—*Middlings.*

Water	11.27
Albuminoids	13.75
Carbohydrates	65.71
Fat	3.69
Cellulose	3.47
Ash	2.11
Flesh-formers	13.75
Force-formers	71.24
Total food-value	84.99

4.—*Mill-feed.*

Water	11.29
Albuminoids	11.38
Carbohydrates	65.52
Fat	4.35
Cellulose	5.22
Ash	2.24
Flesh-formers	11.38
Force-formers	72.04
Total food-value	83.42

5.—*Ground-feed.* (Oats and Corn.)

Water	10.94
Albuminoids	10.94
Carbohydrates	67.39
Fat	4.38
Cellulose	4.52
Ash	1.83
Flesh-formers	10.94
Force-formers	73.96
Total food-value	84.90

In order to make these tables capable of direct comparison, I place below each analysis a statement of the food-value, which is made by leaving out the "water," "woody fibre" and "ash" of each analysis, converting the fat into its starch-value by estimating $2\frac{1}{2}$ parts of carbohydrates for each part of fat, adding the albuminoids to the carbohydrates and calling their sum the total food-value of the given substance, which includes both the flesh-formers and the force-formers.

These tables afford the means of comparing the food-value of different varieties and products, but we must not push them too far. It would be a serious mistake to assume that it is entirely indifferent in what form the carbohydrates appear, provided the food-equivalent is maintained. Thus Lawes and Gilbert found by very careful experiments that sugar and starch are practically identical in food-value; yet every boy knows that there is a wide difference in his enjoyment of food whether a part of the carbohydrates appears in the form of sugar or the whole of them in the form of starch. Offer your horse a lump of sugar and you will find that your sugar-loving boy is not fonder of sweets than is your horse. We enjoy food better which contains some portion of sugar, and the same is true of animals, for the grains of grasses all con-

tain some sugar, and the expression "the sweet grass and herbage" is not a mere figure of speech. All animals will digest better the food which they consume with enjoyment. A certain amount of sugar in food has a practical value above starch *as an appetizer*, and any grain very deficient in sugar will not have the same value for food which it would have if more grateful to the palate. Compare the somewhat tasteless Tuscarora corn with the more toothsome Dent corn in this respect.

So likewise the feeding-value of fat is not entirely measured by multiplying the fat by 2½ and calling the product the starch-equivalent of fat, because *a certain amount of fat is required to secure the complete digestion of starch.* For example, the potato contains an abundance of starch and a considerable amount of albuminoids, but only one-fifth of one per cent of fat. When eating potatoes we instinctively demand some form of fat, and without butter or gravy we consider the potato poor food. The reason is that the large amount of starch in the potato is not capable of complete digestion without the addition of some fat, and our natural appetite knows this if we do not. The same is found true in feeding potatoes to animals. Boussingault found that when pigs were fed on potatoes alone, they soon ceased to grow, but when greasy dish-water was added to the potato diet the pigs fattened rapidly.

Some of you may say that the increase of fat in these pigs can be explained by saying that the fat in the food was laid down as fat in the pigs, and that the digestion or non-digestion of the starch had nothing to do in this matter. This brings up the important subject of

THE SOURCES OF FAT IN THE ANIMAL.

A very earnest discussion of this subject took place between the French chemists on one side and the German chemists on the other side. The French chemists claimed that the animal *never formed fat, but only appropriated and laid down in his body the fat which he found ready-formed in his food;* the German chemists, while conceding that the animal would appropriate the fat present in his food, yet affirmed that the animal *may form a large part of his fat out of the starch, sugar and gum present in his food.* You will at once see that this question is of the highest importance in discussing the relative fattening qualities of different varieties of Indian corn, or other forms of animal food. If the French school is right, it is only necessary to determine the amount of fat present in any variety of corn, and this will settle the question at once. If the German school is right, then the amount of carbohydrates aside from fat, becomes a mattter of great importance in the final determination of the fattening value of any kind of animal food. This discussion was carried on with earnestness for some time, and, curiously enough, the honey bee was the first organism which afforded a decisive answer, for Huber showed that *the bee could form wax from honey.* I need not go through the whole discussion on this subject, but will give the results by saying that careful experiments in the hands of French, German and English chemists have proved that *animals may accumulate fat in their bodies in excess of all the fat contained in their food.—in fact, that most of the fat is formed by the animal out of the starch and sugar in his food.* On this point all chemists are now agreed. The natural fat in the grain is of importance as one source of animal fat; it is also important in promoting the digestion of starch, but it is not the only or the chief source of fat in the animal body.

The experiments of Dr. Miles in feeding pigs, made at the Agricultural College in the years 1868–1870, have already been published in the Reports of the State

Board of Agriculture. From these reports we learn that from 3.8 to 4.8 pounds of meal were used in giving one pound increase in live weight. But the meal was taken in its ordinary condition, when it contains a quantity of water; the increase of live weight also contains water, and the relative amount of water in the increase of live weight and the absolute amount of fat obtained by a given weight of meal was not determined. While these experiments are valuable, they were not planned to draw out the information we must have to settle the question, will starch develop fat in a pig, and, if so, how much will it make? We turn for this information to the very satisfactory experiments of Lawes & Gilbert, of England. In these experiments the amount of fat in the food was carefully determined, the food was estimated as free from all water, and the increase in the animal was also estimated in the dry state. In this way the amount of dry solid increase could be compared with the dry solid matter in 100 pounds of food. In feeding different kinds of animals they found that the increase in fat in the animals was 4 to 5 times as great as the total amount of fat contained in their food. In the case of the pig they found that 100 pounds of dry food gave 17.4 pounds of dry increase in the animal, the other 82.6 pounds appearing to have been cast out of the body in the excretions. Of the 17.4 pounds of increase 16.04 pounds were estimated as fat, 1⅓ pounds as nitrogenous substances, and an insignificant amount as mineral matter. The ready-formed fat in the dry food was 3.96 pounds. There must have been the formation of fat in the body, in excess of that contained in the food, to the extent of 12.08 pounds for every 100 pounds of dry food consumed. If we estimate this fat as formed from starch, and that 2½ parts of starch only equal one part of fat, then 30.2 pounds of dry starch were used to form 12.08 pounds of new fat. The ready-formed fat (3.96 pounds) and the starch, supposed to be converted into new fat to make up the 16.04 pounds of fat in the increase (30.2 pounds) would amount to 34.16 pounds out of every 100 pounds of dry food consumed; add now the 1.36 pounds of nitrogenous and mineral matters stored up in the body, and we find that 35.52 pounds of the dry food is really stored up in the body, and only 64.48 pounds in every 100 pounds of food are rejected in the excretions. The practical result of feeding animals is to *condense the food* and store it up in a more highly elaborated form.

WHITE CORN, OR YELLOW CORN?

Let us now come directly to the question which was raised in the Paw Paw Institute last winter, which is the best to fatten swine, yellow corn or white?

If we will throw out No. 5, Strawberry Roan, as belonging to neither class, we have 7 yellow corns, and 5 white; the average percentage of fat in the yellow corns is 4.92, in the white 5.02. If we reckon the total carbohydrates by replacing the fat in each analysis by 2½ times as much starch, we find the average carbohydrates for yellow corn is 74.44, and for white 75.31. The quantity of albuminoids and of mineral matter in all these specimens of corn being ample for all requirements of fattening swine, and the percentage of fat and of carbohydrates being nearly the same in them all, it would seem that their value for fattening purposes is nearly the same; if there is any difference it is in favor of the white corns. I certainly have found nothing in the chemical composition of these corns which would sustain the position that the yellow corn will fatten swine rapidly, while the white corn will fail to fatten them. If there is this difference, it springs from something outside of their chemical composition.

A DIGRESSION.

Suffer me to turn aside for a little to call your attention to the large amount of starch and chemically similar substances found in these corns. The average amount of sugar in these specimens is equal to 3.61 pounds in each bushel, and the average amount of starch is 34.1 pounds in each bushel of corn. Nine pounds of starch by boiling for a short time with dilute sulphuric acid will make ten pounds of glucose, or artificial grape sugar; the gum may also be changed to glucose by the same process. The boiling is usually effected by sending steam through iron pipes placed in the dilute acid and starch; the acid dissolves some of the iron and thus forms sulphate of iron or copperas, much of which remains in solution. When the starch is all converted into sugar, the acid is neutralized by adding lime to the syrup; sulphate of lime or "plaster" is thus formed, and some of this also remains in solution in the syrup. You thus see that the materials for making this starch sugar are cheap, and the manufacture is comparatively simple. If we estimate 12 pounds of this sugar to a gallon of syrup, a bushel of corn would make 3½ gallons of "golden drips." If you sell your corn for fifty cents a bushel and buy this syrup for seventy-five cents a gallon, you buy back your corn at the rate of two and a half dollars a bushel, and somebody has made two dollars by the transaction! You may console yourselves that you buy back more than you sold. You have, and I will show you what you have got extra, namely, "plaster" and "copperas."

Is not that a dainty dish
To set before the king?

I prize corn as an article of food when cooked in almost any form, but I do not hanker for this syrup. Is it really fit for human food? One reason why so many frauds and cheats are in the market is that so many persons demand *cheap* things as the first condition, no matter what the quality. From *cheap* to *cheat* there is only the change of a single letter. I am no friend of lavish expenditure, but "there is that withholdeth more than is meet, *but it tendeth to poverty.*" In the long run a man must pay a fair price for a fair article: if he pays less than this, he either cheats or gets cheated.

RELATIONS OF THE ALBUMINOIDS TO STOCK-FEEDING.

I have thus far spoken mainly in regard to the carbohydrates, and their relation to the fattening of animals. But the albuminoids are of the first importance in feeding of stock for two reasons: 1. Because they build up and repair the waste of the muscular and nervous systems of animals. 2. Because their presence in the food enables the animal to digest a larger amount of the coarser portions of food than can be digested when the supply of nitrogenous food is deficient. One of the most important principles in stock-feeding is that the amount of carbonaceous and of nitrogenous food must bear a certain relation to each other in order to secure complete digestion of both. If either class is very deficient, a quantity of the other class will remain undigested, and will be wasted as food: the digestive system may adapt itself to slight variations from this standard, but if the variation is marked and continued for any length of time, there will be a waste of food material. If cattle are fed with a large excess of nitrogenous food, the excess is for the most part thrown out in the excretions, and is nearly a complete loss as food; the same holds true of carbonaceous food. The excess in both cases will increase the manure pile, but will not materially benefit the animal. This loss may be

borne in the case of the cheap carbonaceous fodders, but the farmer cannot afford to throw the costly albuminoids to the dung-heap. One of the problems in stock-feeding which requires skill and judgment in its solution is to so apportion these two classes of food to each other as to secure the assimilation of their digestible portions, and to adjust the supply of each to the wants of the animal. We may thus secure complete digestion of food and satisfy the wants of an animal in the condition in which it is placed, whether in store, at work, giving milk, or fitting for the shambles.

Within the last twenty years the Germans have given careful study to the chemistry of stock-feeding. In carrying out their investigations they have applied very rigorous methods to determine what becomes of the food consumed by an animal. For this purpose the food is analyzed to determine just what it contains, and how much it contains of each class of substances, and the amount of this food is accurately determined by weight. The animal himself is weighed daily, and he is placed under such circumstances that the nature and amount of the material thrown off in the breath or exhaled from the skin is determined, and all the liquid and solid excretions are collected and analyzed. Thus an accurate account is kept of all that passes into the body, and out of the body of the animal under experiment. The daily weight of the animal is the balance sheet of the account which shows whether the animal is gaining or losing on a given diet, and an analysis of the excretions as compared with the analysis of the food determines whether the food is all digested, or if any part is not digested, what element of the food thus fails to realize value in the feeding. In this way a great variety of fodders have been tested, and their influence on animal nutrition determined with a degree of accuracy never before attained. The world is under great obligations to these patient Germans, who, testing theory by rigid practice and bringing every result to the test of the balance, have brought out facts of the utmost importance to the stock-feeder and farmer. Nor are these results locked up in the laboratories or embalmed in scientific journals, but they are brought within the comprehension of every one who can read. They are published in the form of an "Agricultural Calendar" or farmer's almanac, which contains analyses ofevery material used for animal food in Germany, and hundreds of formulas for combinations of food materials to meet the requirements of an animal in whatever condition placed. You will find a very interesting account of these investigations, and of some of the results reached in a valuable series of papers prepared by Prof. W. O. Atwater of Connecticut, and published in the American Agriculturist for 1875–6, entitled "Science applied to Farming." I shall use freely the information which Prof. Atwater furnishes in these excellent papers.

The daily ration in all cases is fixed for an animal weighing 1,000 pounds live weight: if the weight of the animal varies from this, the ration will vary in the same proportion.

I present some of the daily rations determined by Dr. Wolff of Hohenheim so far as the amount required of the albuminoids, carbohydrates and fat for an animal weighing 1,000 pounds:

	Albuminoids.	Carbohydrates.	Fat.	Ratio of Albuminoids to Carbohydrates.
Ox at rest in the stall	.9	7.2	0	1:8
Ox at moderate work	1.85	10.15	0	1:5.5
Ox at severe work	2.8	14.4	0	1:4.4
Cow giving milk in winter	2.5	12.5	0	1:5
Cow giving richer ration	3.	12.	0	1:4
For fattening cattle	3.2	14.3	1.2	1:4.5
For growing sheep	1.96	11.8	0	1:6
For fattening sheep	3.6	14.4	1.	1:4

How this amount of albuminoids, etc., may be obtained, I present the following tables, partly obtained from Dr. Wolff's as given in How Crops Grow, and partly from results of analysis of materials at our college:

	Total Organic Matter.	Crude Fibre.	Carbohydrates.	Albuminoids.	Ratio of Albs. to Carbohydrates.	Ratio of Albs. to total Carbonaceous Matter.
Timothy, cut in blossom	81.20	22.70	48.80	7.90	1:5	1:7.37
Average of all the grasses	79.90	28.70	41.70	9.50	1:4.4	1:7.41
Wheat straw	80.20	48.00	30.20	2.	1:15.1	1:39.1
Rye straw	82.50	54.00	27.00	1.5	1:18	1:54.
Oat straw	80.70	40.00	38.20	2.5	1:15.3	1:31.28
Corn stalks	82.00	40.00	39.00	3 0	1:13.	1:26.33
Potatoes	24.1	1.1	21 00	2.0	1:10.5	1:11.5
Rutabagas	12.00	1.1	9.3	1.6	1:5.8	1:6.3
Bran, 60 cents per 100 lbs	82.72	9.13	59.59	14.	1:4.25	1:4.91
Shorts, 80 cents per 100 lbs	84.80	7.46	62.20	15.13	1:4.1	1:4.6
Middlings, $1.00 per 100 lbs	86.62	3.47	69.40	13.75	1:5.04	1:5.3
Millfeed, $1.10 per 100 lbs.	86.47	5.22	69.87	11.38	1:6.14	1:6.6
Ground feed, $1.25 per 100 lbs	87.23	4.52	72.77	10.94	1:6.65	1:7
Average of yellow corns	85.59	2.29	71.81	11.49	1:6.25	1:6.44
Average of white corns	85.56	2.07	72.82	10.69	1:6.81	1:7.

These tables will pay for careful study. For example, you find from the table that an ox at rest requires .9 pounds of albuminoids and 7.2 carbohydrates daily to keep him in condition; the ratio of albuminoids is 1 to 8 of carbohydrates. In good timothy hay the ratio of albuminoids to carbohydrates is 1 to 5, and such hay therefore contains a greater proportion of albuminoids than is required to keep an ox in condition when at rest. The ratio in wheat straw is 1 to 15, which therefore contains less of the albuminoids than is required to keep the ox in condition and enable him to digest all the carbohydrates contained in the straw. If timothy hay and wheat straw are combined in proper proportions, the ox will be as well sustained as he would be when fed on hay alone, and the more perfect digestion of both hay and straw will be secured. If the

ox is at hard work, the addition of straw to his ration of hay will be no benefit, because the hay contains less albuminoids than the working ox needs, and the addition of material still poorer in albuminoids will not help matters. He needs a material richer in albuminoids than the hay, and hence the benefit from the use of grain. By the use of materials very rich in albuminoids the straw may be made as useful for feeding purposes as the costly hay. When I was a boy I saw my brother feed corn to the stock which had nothing but straw to eat, and I asked the reason: "Because it gives them heart." It does not give cattle heart in the literal sense, but it serves to fill the heart with good, healthy blood, which is just as important.

But what I want to call to your especial attention is the great value of bran, shorts and middlings for feeding purposes. Look at the large amount of albuminoids which they contain; look at these cheap mill products, and then at the cheap straw which so often goes to waste, and see how admirably these materials are fitted to each other in stock-feeding, especially of store animals. The straw-stacks which yearly rot down in our fields are a disgrace to our agriculture; yet it is nearly useless to try to crowd it down the throats of our animals without the addition of some form of albuminoids in the form of mill-stuff or oil cake, by which they shall be able to digest the coarse materials and appropriate all their nutritive elements. The subject which will bear profitable study is how to combine our coarse and cheap farm products with some form of albuminoids, and thus secure the more perfect digestion of both classes of animal food. In this way we may "make one hand wash the other" in stock feeding. The results will be manifest in a better condition of our stock, but still more in the increased quantity and better quality of farm-yard manure; and the dung-heap, after all, is the pivot on which turns successful farming.

STATE AGRICULTURAL COLLEGE, January 21, 1879.

DISCUSSION AT DOWAGIAC.

Some one asked Dr. Kedzie whether he had any experience with "oil corn" at the College.

Dr. Kedzie.—I once planted some of it, produced a heavy growth of stalks, but the ears were small and imperfect. I do not think it can be raised successfully in Michigan.

Capt. Hendricks.—A neighbor of mine mixes meal and bran in equal parts, and claims that it is better than an equal weight of meal. I have often noticed that animals fed plenty of good hay will eat straw eagerly when turned out of their stalls.

Hon. J. J. Woodman said he agreed entirely with Dr. Kedzie in regard to the benefit of mixing food in stock-feeding. He said that the analysis that had been made by the doctor during the last two years had been of great value to the farmers.

The following correspondence between Mr. Henry Shultes and Dr. Kedzie is here published as a part of the discussion on the foregoing lecture:

THE USE OF STRAW.

To Prof. R. C. Kedzie, Agricultural College, Lansing, Mich.:

At the Bay City Farmer's Institute you are reported in the Post and Tribune as saying that "the best and surest way to decompose straw is with a match." Many of the farmers of this township have on their farms the straw of from 1,000 to 3,500 bushels of wheat, and the *best* way of disposing of it is, in many cases, quite an important question. We all understand very well that the *easiest* way of disposing of a straw stack is to apply a match. Whether it is the *best* way or not, is the question.

What we wish to know is, has straw any value as a fertilizer when spread upon land dry and plowed under? Or is the value of the labor required to draw, spread and plow under the straw greater than the benefit to the land? In other words, does it "cost more than it comes to" to dispose of it in this way? In the same report you state that unleached ashes are worth for a fertilizer 40 cents per bushel. This is a matter that has been discussed in our grange, and the opinion has been frequently expressed that, as a fertilizer, ashes are of little or no value. Perhaps our mistake has been in the method of application. Information as to the mode of applying, and to what crops ashes should be applied to realize a value of 40 cents per bushel, would be gratefully received by thousands of farmers in the State of Michigan, and especially by the members of Martin grange.

HENRY SHULTES,
Secretary Martin Grange.

MARTIN, Allegan Co., February 19.

REPLY TO MR. SHULTES' LETTER BY DR. KEDZIE.

At the closing meeting of the Bay City Farmers' Institute, I read a paper on the comparative food value of different varieties of Indian corn, and of millstuff, in which I directed attention to the great value of these materials, but especially of shorts and middlings because they enable a stock to digest and assimilate a large amount of straw, cornstalks. etc.; that the mixture of a small amount of shorts with the straw would make a food as sustaining for a store animal as hay; that not only could there be a great saving in the method of feeding, but a larger quantity and an improved quality of manure might thus be obtained, and that the straw-stacks which are now suffered to rot down in our fields are a disgrace to our agriculture.

The illustration of this subject which I saw in the stock-feeding on Mr. McGraw's farm at Bay City, in which about 90 steers were fed with cut straw and corn meal steamed together, the fine condition of the stock and the quality of the manure produced served to fix these facts more strongly on my mind.

At the opening of the Institute the following question (I quote from memory and may not have the exact words), was placed in the question box, and was read at the close of my paper: "Is there any chemical agency by which in a few hours we may compose, transpose, or decompose straw so that we can turn it under the sod without clogging the plow?" As I had already given my ideas about the value and use of straw, I did not wish to go over the same ground before the same audience, I answered the question directly by saying: "Yes, a match will do all that." I had no intention of saying that was the best way of disposing of straw, for my essay had pointed out a better way.

VALUE AND USE OF STRAW.

Where straw is cut before it is too ripe it is of value as food, especially for store cattle. In Germany it is valued at more than half the price of the best hay. But to secure the best results in feeding straw some material rich in albuminoids must be fed with the straw, such as oil-cake, shorts, middlings or clover hay. The straw alone does not contain enough of the albuminoids to secure the complete digestion of the carbohydrates which it contains. If the straw is fed with substances rich in albuminoids, the manure will be as rich as that made from hay.

Yet I think it is the general experience of farmers that there is little profit in feeding stock with straw alone, and the Martin Grange may ask me where can they obtain the materials rich in albuminoids to enable them to use up such an amount of straw in stock-feeding? Let me ask them in return, what is done with the 1,000 to 3,500 bushels of wheat? Is it milled at home, the costly flour sold for export, while the low-priced middlings, shorts and bran are retained to work off the straw, one cheap product thus added to a cheap material, causing large gain to the farmer and increased fertility to the farm, or is the wheat sold in bulk with loss of all these food materials? Can the farm or the farmer afford this?

Mr. Shultes asks, "Has straw any value as a fertilizer when spread upon land dry and plowed under?" I answer that straw has a manurial value in itself, If we compare moderately rotted stable manure and wheat straw in regard to their contents of the three most valuable manurial elements, nitrogen, potash and phosphoric acid, we find that, weight for weight, the manure and the straw have nearly the same value; the manure contains more water and the straw more vegetable matter, but in other respects their value is nearly equal. The straw is more bulky and difficult to cover, but once placed beneath the soil and decomposed there is a positive addition to the available plant-food in the soil. Whether it would pay to handle it for this manurial value, the practical farmer can tell better than I. Wherever the soil is

deficient in vegetable matter, the straw may be of great value when plowed under, by the large increase of vegetable mould formed by the decay of the straw. In sandy and gravelly soils the organic matter of the soil is soon exhausted, unless renewed by plowing up green sward or turning under long manure, straw, corn-stalks, etc. By the decay of such materials under the soil we promote the decomposition of mineral substances in the soil, as well as increase the vegetable mould.

WOOD ASHES.

The ashes of different species of wood have a general resemblance in composition, yet they differ appreciably from each other. The ash is the mineral element of any vegetable structure, and without the ash the vegetable could not have been formed. *The ash is an indispensable element of plant-growth.* Some of the elements of ashes are found in abundance in most soils, while others are often found in too small amount to produce full crops. This is often true in the case of soils which have been cropped for a long time.

The most valuable substances in the ash of plants are potash, phosphoric acid, lime, magnesia, sulphuric acid, etc. If we take the ashes of body wood of the beech as a fair representative of wood ashes, the German chemist Wolff states that they contain 16 per cent of potash; a bushel (60 pounds) of such ashes would contain 9.6 pounds of potash which at 4½ cents a pound would come to more than 40 cents, to say nothing of the 33 pounds of lime, 6 pounds of magnesia, 3 pounds of phosphoric acid, etc., etc., found in the bushel of ashes. When we reflect that a bushel of ashes represents the mineral matter of 2 to 4 tons of vegetable matter, we see how valuable they must be in sustaining vegetable growth unless the plant finds an abundance of such mineral matter in the soil in an available form.

I single out potash from the ash materials because it constitutes so large a part of the ash of many of our most valuable plants, because the supply is so soon exhausted in some soils, and because it is indispensable for plant growth. In our grasses, potash makes up from 25 to 40 per cent. of the ash; in clovers, and peas, from 30 to 46 per cent., and in root crops, potatoes, beets, turnips, etc., from 36 to 65 per cent.

All of these crops will be benefited by wood ashes unless the soil already contains all the potash the plant requires. The grain crops are not equally benefited by a dose of wood ashes because the potash is found in smaller amount in their ash.

If farmers will try the experiment of dressing their clover meadows with wood ashes, or will apply it to their turnips and rutabagas, they will not hereafter sell their ashes for six pence a bushel and take watered soft soap for their pay. If they persist in selling off this floating capital of their soil, they will be clothed in sack-cloth and ashes while their farms will go naked. Better clothe your fields in ashes and use your sack-cloth to bag your crops.

R. C. KEDZIE.

AGRICULTURAL COLLEGE,
February 25, 1879.

SCIENCE AND THE INDUSTRIAL ARTS IN EDUCATION.

BY PROF. GEO. T. FAIRCHILD.

[Deliverd at Charlotte and Flint Institutes.]

The subject of education is no longer new; and yet it can never be old. The grand problem of civilization in all its intricacies of human weal reduces at last to the problem of education. What can be done for a community, the nation or the race, is limited by the capacity of its individual members; and this capacity is the direct result of education. The growth of all the ages past is to our advantage, only as our training fits us to accept its results and push forward.

Is it strange then that such a universal problem should have to be solved

again and again, as each generation comes to get and to give its share of the world's good? Or is it strange that so vital a matter to all interests should be the pet of theorizers, those universal geniuses who seek a panacea for all evils? Quackery is by no means confined to one profession. Every good work has gained a ridiculous side from some of its hobby-riders, and popular education has not suffered least from such one-sided views. But the more we know of each other's experience and thought the less of mischief will be done by any new experiment; so we may rightly venture to discuss the modern forms of the same old questions. The fact that "doctors disagree" has not kept the world from actual progress in combating disease, nor need it keep us from success in the combat of learning with ignorance, of efficiency with helplessness.

The aim, I suppose, of every system of education in any age, is efficiency in all that pertains to genuine manhood. The essential principles of development in our common human nature, too, must ever remain the same. A general view of this aim and these principles, as well as some suggestions as to methods, I had the pleasure of presenting on a similar occasion one year ago, under the theme, "A Practical Education." These principles can never be lost sight of; and yet their practical application at every step must vary with each change of circumstances. A half century ago, when "Uncle Sam was rich enough to give us all a farm," every body was satisfied that with free schools well supported, our social, commercial and national prosperity was secured. There was little question then as to scope and methods. A quarter of a century since, when cities had begun to hide their thousands of tradesmen and mechanics and menials from the healthy outer life, and all through our eastern borders' factory and farm were beginning to crowd each other, the problem of social prosperity, at least, assumed a new phase; and the world asked if our schools had kept pace with our wants in the kind of knowledge taught. Then came the educational war of science with the classics, the noise of whose combats still echoes occasionally from the remoter outskirts of the field, although the main question is happily settled by a harmonious blending of the two in college curriculum and school classification.

Now, when extreme division of labor has cramped the powers of body and mind among a crowded city population; when invention has been stimulated to a waste of intelligence, energy and wealth in almost every employment; when a generous trade, through excessive speculation, has degenerated into greed; when wit is thought to afford a shorter road to wealth than work offers; when the wants of the masses outrun their ability to meet them in spite of our education, it is natural and proper that we should have a new questioning of our means of culture.

Have we not, of late, fostered learning before ability, and so encouraged mere curious speculation rather than practical talent? Have not our tests of scholarship by examination been too much a trial of capacity for acquiring memorized facts, and too little a proof of thorough understanding of foundation principles in science and literature? Why do we all laugh with a wink of earnestness at the newspaper story about the boy's perfect readiness to give correctly for twenty-five cents the capital cities of Europe, and his equally ready answer to the question whether they are animal or vegetable? Is there not a quite general feeling that the youth in our public schools know too much and do too little? Who can answer effectively the current complaints from newspaper and platform that our highest education is compatible with a poetical idiocy? These are questions which crowd upon school boards and into

State teachers' associations. They are only partially answered to most men by the fact that a college education multiplies by fifty the chances of promotion to offices of trust and authority, and brings into active life at least ten years earlier. Our assertion that these educated idiots, as they are called, are the exceptions is met with a "may be so," or at least with a look of doubt.

We cannot wonder, then, if there appears a disposition to experiment in some new process, or some new adjustment of old methods. Usually, as in most other reforms, the first effort is to reach an extreme in opposition to what is pronounced a failure. So at this time we find a class of earnest men, convinced of the inefficiency of our present schools, rushing to the conclusion that, not science, not literature, but industrial arts are the subjects to be taught. Since a comfortable living is the first requisite of happiness, should we not secure first that training in skill which may ensure ability to earn such a living? Since the industrial arts must ever be the foundation of material wealth, and so of all prosperity, are not these the solid basis of training for efficient men? Let the few who have leisure delve in the mysteries of science or the intricacies of mathematics, but the many must find their work and their wisdom in a trade well learned. This view is supported by a grand array of facts where none are needed, while only conjectures are offered to prove the doubtful statement, that proper education and true wisdom will result from such training in a single art or in several of them.

But without deciding the question, let us briefly examine the nature and the relation of science and these arts with a view to their use in the training of youth up to maturity, so as to develop the ability sought in every system of education.

Science—and I suppose we shall all accept the definition—is such an arrangement of the facts in the world of nature, including humanity, as to set forth the underlying principles of its existence. Facts without clear logical arrangement are not science; and speculations without facts are not science,—though both may be involved in its study. Science seeks to bring all facts and all phenomena into their proper relations as cause or effect. The man of science gathers facts for classification and analysis, that he may know, not only of what the world is made, but how its parts are adjusted, and under what uniform principles it takes its onward course. The laws of mind and of matter are his never-ending study. Do not smile in superior wisdom if he cannot tell you the definite use of all his knowlege. You might find the same difficulty in answering the simple question, what is the use of sunlight? All of us believe that knowledge truly scientific is the basis of all prudent action and of all progress; and—leaving pure wickedness aside—that imperfect, that is, unscientific knowledge is the source of all waste and destruction, the "little learning" which is the "dangerous thing." Need the scientific investigator trouble himself about the immediate application of his discovery under patent of his government or for his private benefit, when he finds that every universal fact in the past has found its niche in the world of action? Every day brings to notice the boundaries of human power because of limited knowledge. Like Agassiz and Faraday, he has "no time to make money," because he is making the truth for future generations. The fortune he labors to leave to the world is always as dear to him as if it were counted in stocks or bonds or golden eagles; for it represents his labor of love to the world.

That even abstruse science is of use to the world—to you and to me—may be shown in a general way by illustrations. Nothing could seem less immediately useful than Galvani's tickling the frog's leg with his various metallic

points, or Volta's playing with his little metal discs; and yet it is easy to see that the whole system of telegraphs, telephones, electric lights and storm signals grows out of such insignificant beginnings. If these men or their hundreds of successors had worked only upon the investigation that pays cash down, neither they nor their work would have troubled the world long, and we their beneficiaries might have plodded along unconscious of a weight of obligation. Are we sorry that those men pursued science for its own truth's sake?

To you and me it seems a waste, perhaps, to spend whole years in preparation, and whole days and nights in counting, comparing and measuring the relations of more than 200,000 fixed stars; and yet, it is by just such perfect mapping of the heavens that trackless seas are made safe thoroughfares for the nations and their wares. Thus the stars become the seaman's guideposts, an essential in the machinery of commerce, and so efficient aids to every artizan, every business man and every ploughman. This work could never have been done for only its immediate use. Only the loving zeal of the true scientific spirit could have wrought with the needed patience in all that complicated machinery, physical and mathematical, which makes such work possible and accurate. Even the larger and more definite view of the universe in which we are a part, gained now by every child in our public schools, may well repay the race for the cost of such an undertaking.

But when we think that every advance in general wealth and power is a triumph of mind over matter, and that every such triumph is an application of scientific truth mined for by students of science with the patience and endurance of devotees, we can but bow under the rule of science, as the mistress of power, and render homage to such prime ministers of hers as Galileo, Kepler, Newton, Faraday, Agassiz and Henry. If we can find a part of the race without strength to do more than live in a combat with the elements, we are sure of its being outside the realm of science.

But in thus paying tribute to science do we disparage the arts? No! if science is made up of classified facts grouped under principles, the arts are applications of those principles in meeting wants and susceptibilities. The very inventions by which discoveries of science are made useful and the very materials that science grows upon are from the arts. If science is the source of power, the arts are its means of conveyance. Everywhere in the history of the world the two have helped each other. Whenever and wherever for any reason science has been suppressed, the arts have awaited its emancipation. Think of the middle ages, shut up to the arts of adornment, because it was sacrilege to know more of the universe than patriarchs, apostles and fathers had taught! Think of Spain under a niggardly fear of intelligence! Remember our own sunny South untaught in science and unskilled in the industrial arts. On the other hand, wherever for any reason the useful arts have lagged behind, science has degenerated into mere curious speculations about possible or conceivable relations, with little attention to actual facts. Then both knowledge and art fall together. Such appeared to be the condition of that ancient civilization when a philosopher felt obliged to apologize to his fellow wisemen for having once prostituted his learning to utility; he had enumerated among the advantages of philosophy a few material comforts derived from it. Such may be our fate, if we allow a divorcement of these perpetual partners in human progress.

But to realize how closely united these are, it is best to analyze further their bond of union. In what respects is one the constant attendant of the others in everyday life? I have shown in a general way how science everywhere per-

vades the arts, giving them dignity and efficiency, and how the arts utilize science in its various minutiæ and support it in healthy growth. Every person can add from his own experience and knowledge abundance of illustrations. If agriculture has owed less than other arts in the past, it has been because of a forced separation under a too narrow view of the art, or a faulty conception of the possibilities in science applied to the soil. Yet even here there is enough to encourage the most doubtful in an effort for closer union. The oft-noted failures in so-called book-farming are themselves a proof of the need of a proper combination of science and art in this calling. Any effort to treat a general principle as a practical rule, to be followed in all conditions, is trying to use science as an art; and any effort to extend a practical rule of a certain experience into a general principle is to misuse an art by treating it as science. Both these efforts cause failures—loss of wealth, loss of hope and loss of faith —and both are the result of imperfectly mastered science or poorly developed skill. Sometimes chemical and botanical science have wandered into vain speculations as to agriculture, simply because practice lagged too far behind to keep these sciences on their mettle. Sometimes a practical rule of merit has been too hastily thrown aside or disputed, simply because it was stated as a principle. The question of deep and shallow plowing, so often bantered about in farmers' clubs and agricultural journals, is usually stated as a question of science; but each individual's answer to the question is simply a part of his rule of conduct for a successful crop. As experience, it forms one item of value among a long list to be grouped around the underlying principles of vegetable growth. The same may be said for the ever reviving chess controversy. So long as a practical wheat grower holds to the statement that if he himself suffers in his wheat field a certain amount of trampling or frost, it will produce for him a crop of chess, he is doubtless correct, for he is giving only a rule for his own proper guidance. When he merely changes the person and says, "If you treat your wheat field in this way it will produce chess," he may or may not be correct, according to varying conditions of clean seed or clean soil. But when he states that the wheat plant turns into a chess plant under such treatment, he has put his very sound rule into form of a very unsound principle. His successful art makes very unsuccessful science, and all are the losers by such an unnecessary strain.

And yet these very controversies, so misunderstood, are a testimony to the close relations of principles and practice; though each may stand jealously aloof from the other when formally introduced, they are the nearest and most intimate of neighbors. The fact is that an effort at knowledge of the unwavering laws of nature is as natural as breathing, and the most narrow experience is most likely to be confounded with their discovery. A lesson of my youth at another's expense has saved me from some such blunders:—A neighbor was threshing for us, in the old, unscientific way of thumping the floor with a flail, and as we turned the bundles or bound the straw, he entertained us boys with wondrous tales of his skill in horse-breaking. He was a "scienced colt-tamer" beyond a doubt. But science unapplied we are all dissatisfied with, if we do not distrust it; and since we had the materials at hand for a test, it must be tried. The colt, a wiry, wily thoroughbred, was led into the yard, where our confident man of skill prepared to mount him. The reins were gathered as if to mount a lady's pony; there was a confident spring of the man, a single plunge of the horse, a somersault over fifteen feet of earth, and a bruised horse-tamer, stiffly picking himself up with the remark,—ever since a by-word in our family, "Jones' colt never made no such motions as that." The colt awaited the

handling of a larger experience, and science in horse-training was quietly shelved for that winter.

This simple story has its counterpart in almost every art, and that because of the so intimate relation of principles and practice, one everywhere pervading the other, whether rightly recognized or not.

A more striking proof of this intimate relation of science and the arts is found in the fact that science often explains the reasons for a practical rule long after the rule has become thoroughly established on the "cut and try" method; while the arts furnish always the best of illustrations for science. This fact shows mutual relations, not independence. Suppose agriculture to be wholly "an empirical art," that is, wrought out by experience of facts alone through all the ages since men began to till the soil and wait for the harvest. Still the principles of nature in turning soil and seed, sunshine and shower, into produce underlie the whole, simplifying and unifying practice whenever they can be discovered; and the abundant data of facts in these practical rules must be a part of the information out of which science is created. When both are made to unite in spirit and purpose, we may expect a more definite and clearly developed art as well as more exact science.

Such has been the tendency in other callings. The working of metals in its recent perfections combines the older art and the newer sciences. The modern dyes and pigments are results of a similar combination. The economy of great manufactories, in which scarcely so much as the smoke is allowed to go to waste, calls in the same assistance. The grand advance in perfection of machinery is by acknowledgment of the same relationship. Even those wonders of inventive genius, which of late attract so much attention, are from the same combination.

Elisha Gray was a college-mate of mine, who earned his way more than half through college by working at his trade of joiner, showing in his scholarship a decided scientific bias. He left his course to enter a business life too limited to employ the full strength of his abilities; and so he let his mind run upon some of the wants of the telegraph, applying his scientific bent and mechanical skill to the catching and re-enforcing of feeble electric currents. His success in a new relay magnet put him into the employ of the Western Union Telegraph Company as inventor. What did he do? Shut himself into his workshop that he might, like the boy with the fiddle, make his machines "out of his own head." No; he studied and wrought together, mastered the knowledge of others and experimented in the same lines,—in short, trained himself into a scientific observer in the field of galvanic electricity. After years of such work, it was an accident that revealed to him the foundation facts of telephonic action, but an accident that could not have happened to any other one not already so well versed in such matters. Then he made a study of his facts, compared them with every other known phenomenon of similar nature, and so mastered his subject that when he came to present it before Professor Tyndall, the great authority in questions pertaining to sound, he was unabashed by even the Professor's utter scepticism, for he knew how triumphantly he should meet it. Said he, when recounting this experience, "Invention requires a peculiar training in minute scientific observation. It must be made a business by itself." But for such a business, who cannot see the need of union between art and science?

Similar to this, undoubtedly, must be the later growth in all the arts. Science extends the particulars of each and gives a firm foundation for future progress, while the arts become the main support of science in its deeper inves-

tigations. Let no artisan forgot this opening for a more perfect art; nor let him demand of science more than he gives in return by a generous support and a thrifty following. Let no scientist allow his thoughts to overlook his nearest neighbor in his investigations, lest he lack the principal end and the principal means of his existence.

I know that many practical men, and successful ones, too, gain little direct aid from any science. They have their rules and tables, tools and instruments, that, with a good degree of common sense, serve them better than any smattering of science that a few years of schooling could give. An excellent joiner of my acquaintance undertook to study geometry; but after a few lessons threw it aside, "because it wasn't practical enough." It didn't tell him just how to cut his bevels for a hip in his ventilator hood, nor calculate for him the curves of an irregular stairway. He had more useful books than any geometry. Yet was it not by the exact reasoning of geometrical science that most of his rules were established? and would not a clear conception of geometrical principles give to those very rules a readier daily use with a larger chance for proper variation to changed circumstances? A surveyor, with good instruments and tables, may do much excellent work without a knowledge of trigonometry, geometry, or any leading part of the mathematics upon which his art is founded; but who would trust him in any intricate problem? or how could he expect to grow in power or to further his art? To be safe in his work, he must be a mere machine worker all his days. If ambitious, he is likely to undertake tasks in which he must fail, or in higher engineering to build structures like the Ashtabula bridge, a trap for the innocent and a crime against humanity. Business men discard the lengthy rules and principles of arithmetic, to use interest tables and ready reckoners; but would they deny the practical value of arithmetic because a few of its applications can be kept on hand like ready-made clothing? or would they expect a clerk unversed in arithmetic to be more than a machine in his calculations? If a person without these foundations of scientific truth ventures out of his routine, there is almost certain waste—at least of his own energy. I knew an excellent man of some little ability and general culture, who, with only the merest elements of geometry, spent the best years of his life and the comfort of his family in trying to square the circle by means of his rule and compasses. How many thousands have dreamed, if not worked, over schemes for perpetual motion through application of gravity! And yet a very elementary course in the science of mechanics proves the problem just as possible as "lifting yourself by your own boot-straps." A respected friend of mine, a noted teacher in the days of the four rules, once built an apparatus of pipes and a cask for making water flow from a well by force of its own weight. A few small pipes up and larger but shorter ones down, arranged alternately, and a cask with a faucet at the upper end assured a greater *weight* of water on the shorter side. Filling the whole with water, and turning the stop-cock, he expected to see it run on until the well was dry. He thought it failed for want of air-tight joints, "for it made a terrible fizzing," and for fifty years all his children, grandchildren and great-grandchildren have failed to fully convince him otherwise. Such misconception is not uncommon even with our more general dissemination of scientific truth. No doubt, if it were announced in to-morrow's paper that Edison had invented a simple contrivance for making water run up hill with no expense of force, half the readers would believe it. What a monument to such ignorance is found in the piles of rejected applications in our Patent Office and in the museums of models deposited throughout the land! That silly search of the ancients for "the

philosopher's stone" has in this generation its thousands of counterparts, all alike in an effort to make something out of nothing. Nor are we all fools, however fooled, because we follow these notions. Some are shrewed business men and some are skilled artisans, some are learned men and some are so-called scientists, each in his way wise, but all without that training in scientific thought, as well as scientific fact, which includes wisdom in art and knowledge.

If, now, science and the arts are so intimately united in practical life, how ought they to be adjusted in our schemes of education? If science everywhere pervades the arts and the arts make science of use; if science explains the mysteries of arts and arts furnish the best of illustrations for science; if science extends the possibilities of the arts and suggests their line of development, while the arts support and stimulate scientific investigations, ought they not to have equal place in a system of general education? Perhaps so; yet, not only this relation but the very practical differences must be taken into account. Science deals in generalizations principally, all its data being grouped under general truths; the arts deal mostly in specifications, each minute item of detail being essential to the whole. Science calls for a rapid glance at many particulars to find a unity in all, or else a very accurate observation of complex phenomena, so as to see the whole in all its parts; the arts in modern life give most attention to a single particular at a time, or to each item in the complexity, so that each part may be wrought by a different individual. Science is expressed in general principles; the arts are expressed in specific rules. Science has for its object knowing; the arts are concerned with doing. The personal result of scientific pursuit is *wisdom* in some particular line of thought; that of pursuing an art is *skill* in that particular line of action.

Now, while these facts prove the two still more nearly related, as complements of each other in the economy of human action, they also prove the difficulty of uniting them directly in the usual course of training. Put a boy to a trade, and he must become at once the subject of routine and details; introduce him to the study of science and he must master details, to be sure, but only to press on toward the general truth. Undertake to teach him science and at the same time to perfect him in a trade, and one or the other is very likely to be subordinated completely, or both to be failures.

This, I think, explains the fact that so many manual-labor schools have failed; and partially, also, the very prevalent notion that extended education is of little use, if not a damage, in the trades. Those once popular schools made excellent promises of supporting the student in his course, teaching him a trade, and fitting him for a profession. They could do none of these successfully, and very fortunately failed before serious damage resulted. Very unfortunately, however, they have left behind them the ill odor of their shortcomings attached to every effort to combine education with the arts. This operates in different ways according to the bias of the inquirer. One who regards science of chief importance, as mother of arts and inspirer of general industry, will deplore the expense which a system of labor involves, and decry the waste of energy and time to a student required to perform it. One who looks upon the trades as the only sources of production, will complain that so much attention is given to general knowledge and culture as to afford very imperfect, if any, training in the arts. The former class would abandon the effort as useless, and leave the world to wag with labor and learning hopelessly divorced. "Let wisdom come to the few and let the rabble be driven to their tasks by the goad of hunger," is their decision.

But in a country like ours, where labor wields the rights of wisdom and furnishes the power for support of our institutions, such a policy is not safe, if it were humane. The very interests of education itself depend upon the support it gains from men of culture in every calling. Our schools must meet the wants of a whole generation, or they will cease to exist. Moreover, the growing spirit of defiance for the authority of history or philosophy can be provided against only through training up a generation with the intelligence and the experience together that shall give a wise solution for vexed questions in social and political science out of the very heart of labor itself.

All that possible development of taste and judgment, too, that must be depended upon to make these arts, not merely more productive, but more richly productive, so as to extend our wares to meet the wants of all the earth, is to be lost sight of in such a policy. If the artizan is to be always uncultivated because he is a workman; if the farmer must be a "clodhopper" because he holds the plow, our boasted progress is backward, and we had better retrace our steps to the good old times of Cincinnatus, the ploughman and statesman together. But we know that this need not be, and believe that a reasonable degree of strength can come to both muscles and brain, if training and culture are rightly adjusted.

Shall we, then, go to the other extreme, and subordinate all to the trade, overcoming the natural opposition between the widening views of science and the narrow routine of a trade by cutting the science to fit the trade? Shall the effort be simply to add a sort of mental dexterity to a physical one in a single line of work? With such intent, we shall say to a youth of twelve or fifteen, "We'll make a mechanic of you, and for this purpose we'll dose out with your daily routine of apprenticeship such facts as you will be likely to use most. Mathematics, beyond the prime rules of arithmetic, is not so useful as many facts in a table of strength of materials; but we'll take the practical part of mechanical philosophy, with chemistry enough to instruct you in the nature of the elements you handle. The rest shall come from the history and illustrations of your trade." For the farmer the course would be varied slightly by giving even less of mathematics and chemistry, but introducing short courses in botany and mineralogy with abundance of technical facts and rules in agriculture and horticulture.

All this assumes that information is education; but is it so? You may fill the memory with facts of any kind and so long as you do not train your thinking powers to wider observation and more accurate judgment, you grow only the more arrogant and narrow-minded. Such a training, if practicable, makes men as nearly perfect machines as voluntary human souls can be. Its legitimate results would be to make even more narrow than it now is the routine of a workman's life. Extreme division of labor in the arts already weakens body and mind and will, and crowds into cliques and classes. The only check as yet found to operate against this tendency is a foundation of general knowledge, revealing such a unity of truth as draws one away at times from his own narrow needs. When, as one of the wise men has it, all the farmer's "talk is of bullocks" and "he giveth his mind to make furrows," do you not expect that however "wise in his own work" he may be, "all his desire is in the work of his craft," and realize his inability to "sit on the judge's seat or understand the sentence of judgment?" If this is true of one who binds himself down to the details of farming, in which there is such diversity of employment, such a variety of calls for ingenuity and judgment, how much more true is it in any of the more restricted arts and trades. Instead

of being made by his schooling so much more the reasonable man, exalting his calling by his culture and wisdom along with skill, he must be so much more the finished tool in the hands of one who is smart enough to use him. His very absorption in his own calling puts him at the mercy of sharpers in every other interest, and, instead of training himself so as to break down the barriers of isolation which hinder his recognition by the rest of the world, he is building them higher and stronger. The room for future growth in general ability and general knowledge, that can bring enjoyment of a stalwart manhood or a ripe old age, is not provided for. All this training is for the art, and not for the artizan or his advantage in using the products of art. Is this just to humanity? Is it even reasonable to expect success in the very narrow line of that particular art chosen? Real work of any high order in the world finds a motive in some form of philanthropy. A culture of the emotions and the tastes is therefore quite as essential to a successful art as to anything else in the world. When does the farmer brood over his cares and groan over his toils, but when he shuts himself away from fair comparison with the rest of the working world by taking no part in it? When does the farmer's boy long to shirk his tasks and fly away to a life in the brisker world, but when his face has been held too steadily to the same grindstone with only an occasional stolen glimpse of the work about him? In the history of the fine arts the grand successes have not fallen to the narrow specialists. In the realm of scientific investigation there is waste from taking too narrow a field, in which the principal relations for comparison are lost sight of. Real and apparent discoveries take equal rank then. So in the industrial arts themselves this special training tends to confine to those minute perfections that result from following a model. The true inventive spirit is not fostered, but quenched, by this confinement within a single channel of thought and action.

Nor is the progress in learning the trade likely to be as rapid as is supposed. The finer parts of the trades, and most of the manual operations of all arts are such that one can become skillful only by habitual practice. As in the art of penmanship "practice" alone, with fair models, "makes perfect," and all the science of ink and pen and paper and curves and combinations and conformations with all the history of the art from the Phœnicians down, cannot give to the willing mind one whit better control over the unwilling muscles; so under this proposed system in general art, the fund of information combined with practice can add little of vivacity or readiness, and may be but so much lumber to be carried.

Further than this, the course itself fails to become attractive. The details of the art are better and more rapidly mastered in a practical apprenticeship. The so-called scientific instruction is so curtailed in its scope and dimensions as to lose almost its character of science. The realm of suggestive and quickening thought is shut out by the demands of the trade.

Thus, it seems to me, from the very nature of knowledge and skill, these efforts to subordinate the one to the other must prove useless so far as promoting the arts or elevating the artizan is concerned. Their chief success is in fitting a young man for a sort of gentleman foreman among inferior workmen. In some countries such training schools are useful and necessary, and they may become so in our own; but they do not touch the question of popular education at all, and have no place whatever in solution of the questions we are asking for whole communities.

The real answer to the question, "How shall science be made more useful and elevating to the masses engaged in the industrial arts?" lies, I think,

somewhere in the golden mean between these two extremes, of science supreme over the arts and subordinate to the arts. She must be neither mistress nor slave, but the thrifty helpmate. Science is to be wooed and won by treating her according to her nature; she is ever shy of those who distrust or maltreat her. By this I mean that the study of science must always be with the genuine spirit of enquiry. The youth who cannot bring to his study an honest love of it can never succeed in any science. This implies the need of encouraging as early as may be the inquisitive tendency of children, by directing their energies toward finding their own questions and the proper answers in nature itself. This is easily done with but little knowledge of scientific matters and with no familiarity in scientific terms. Let the boys gather their little museums of woods and stones and bones and birds' eggs, and even of skins and fish and reptiles, always keeping alive the one object-knowledge. Thus their observing faculties are quickened and trained, while they gain an experimental knowledge of nature right at home, which serves as the very best of introductions to the broad fields of natural history. The grand scheme of classification in zoölogy becomes a most desirable acquisition to one who has already traced resemblances and differences of the nicest shade in his own surroundings. The scientific arrangement of botanical facts is gladly welcomed by one who has grasped after such truths in childhood. Meanwhile this early crude inquiry is a most excellent stimulant to ingenuity and tact. What can more fully tax the creative faculties of a boy of ten or twelve, than to gather, prepare and arrange a cabinet of minerals or plants or animal products. The mother who cannot afford a corner for such "litter" may be thankful if she meet no worse disgrace; and the father who treats the boy's treasures of this kind as rubbish, may wish for riddance of a rubbish of bad habits far more annoying.

The next step will be to call in the aid of books. A child-student of nature will learn to read about animals, flowers and natural scenery without being driven to the task; and if his judgment has had due range at home, even those strange mixtures of fact and fancy called travels cannot do him serious harm, for he becomes a natural critic.

In the schools, so far, the child has been occupied with the very fundamentals of all training, and these will seem to have found their use immediately. The skillful teacher knows how to take advantage of these natural incentives, so as to make a double advancement possible by adding to ability as well as to knowledge. Even taste and character can be developed in the very rudest surroundings by aid of such a hold upon the childish nature. I have sometimes wished, as duty brought me into the summer country schools, where the little five and six year olds alternately read and play and sleep, that dame nature might be more the mistress there. What a world of intelligence might be awakened in those drowsy little pates by establishing a temporary cabinet of curiosities!

But advancing to the higher education, we shall find the same laws of development. The elements of scientific truth, whether in language, mathematics, natural history, chemistry or philosophy, must always be the means of mental discipline; and the more extensive the view which can be actually gained, intelligently, the better the drill for observation, judgment, retentiveness and all those really practical qualities which give genuine mental ability. By an extensive view I by no means intend to encourage that immense multiplication of facts by which the whole universe is poured through the memory, catching in its meshes barely long enough to be recited. All the facts I would have so

grouped about some central truth as to enforce that truth at each recurrence, while the same central truth will serve to bring from remotest memory most of the facts that support it.

For a familiar illustration take Geography—that usually miscellaneous collector of isolated facts, astronomical, topographical, historical and statistical, which most of us spend several years of our lives in remembering and forgetting, under the impression that at some future time such information may be useful to us. We may take the same facts gathered about the main central truths concerning the relation of a man's abode to his actions, then extended to the elements of national power or weakness, and we shall have a group of subjects, or topics, logically connected, easily applied, stimulating further research and serving, like the index of a book, to recall your thoughts of years long past.

All studies are made a means of mental growth according as some such scientific basis is found for them. Chemistry, with its wonderful array of facts, is one of the best disciplinary studies, because those facts are so closely linked to a few central principles as exact as mathematics. So the study of a strange language, under proper teaching, gives a better understanding of the principles of language than the same time spent upon our own, because these principles are constantly illustrated by the effort needed to comprehend and express. In such ways both sciences and languages are made to establish the habit of thoughtfulness, while they also embrace a larger fund of information than could be mastered by any other process. After these, the more strictly mental sciences will help one to understand his methods of thinking and establish his habits more firmly.

Such a course, for such a purpose, involves the element of time, and the steady pull of years always outweighs the rapid spirt of cramming. In the four to six years thus employed, say between the ages of fifteen and twenty-one, this youth must be so occupied in daily labor with his hands as to maintain the spirit of industry and cultivate the tact so essential in any of the arts. Such labor needs to be honest and earnest, and at the same time illustrative of the principles mastered in study. It must be full of details, again and again repeated, so that the work becomes an application of the new truth to a real life. All the regularity, all the responsibility, all the accuracy must be required that would be in any apprenticeship. The whole must bring the student into the great company of producers, under the general laws of production. His work and wages must have their proper relation, and all the machinery of strict accounts must accustom him to business habits.

Such work can be found in many of the trades; but, as I have already shown, the tendency of most of the arts is to so subdivide labor as to narrow the field of thought and action. This, for such a purpose as ours, cannot be done. Whatever trade shall furnish such work must give to each student variety enough to interest his thoughts in its many applications of his studies. Blended with the daily practice, under the same corps of instructors, must be whatever of purely technical study occupies a place in his course. How extensive this ought to be will depend upon the time spent in gaining an education. It must not exclude the discipline of scientific thought, and it must include enough to make every day's labor more interesting and instructive.

In this plan, of course, that constant practice of one motion till routine has made it second nature, is postponed till this preliminary training is finished. And yet, the every day toil in a variety of details has made those details

familiar and given a general dexterity, while exact instructions and genuine science have raised them out of mere routine.

Such I believe to be the system which best solves the problem of education for farmers and artisans. It gives educated, not merely skilled, labor; and that is what we need. The skill will come quickly afterward, with added zest and efficiency from the course of study pursued, and instead of having simply good workers, or simply operatives, we shall have good men in every sense of the term.

I have treated this subject almost entirely from the standpoint of theory founded upon the nature of the case; but I have done so to show how carefully the policy of our State Agricultural College has been studied with reference to its ends. I might have shown how this policy has been largely the result of careful experiment; how the course of study has been adjusted and readjusted to meet the discovered wants of such students; and how the work system has been modified as experience suggested. But it seemed to me wise to go back of these facts to search for some of the principles which explain the facts.

If still you say, "'The proof of the pudding is in the eating,' show us the fruits of your labor," we shall not hesitate, though such an institution is not like the dwarf peartree, hurried to its maturity. Having just reached its majority, its fruitfulness is scarcely yet fairly tested.

Of the 186 graduates more than three-fifths have left us within the last five years and few of these are old enough to have made a name, especially in agriculture, where capital as well as wisdom counts so much. We only know that almost half are directly engaged in farming or gardening, and steadily making a name for themselves, their college and their calling. Most of the rest are working their way into influence by teaching or active business life; and of the few who choose to put their practical education to use in law or medicine, we have as yet no reason to be ashamed. Of many of the older ones the college is proud already for the good work they do in earnest labor. To the whole body she points in the spirit of the Roman matron, saying, "These are my jewels."

But there are other evidences that this work, however imperfect as yet, is aimed aright. This pioneer in such education long trod the road alone, meeting only the questioning glance and conditional praise. Now, among all the experiments in industrial education, ours is pointed to as the successful one. Our own neighbors are beginning to trust it. Enquirers from distant states come to visit it and study its methods, and some of them send their sons. The leading Scotch journal sends a representative to this country to study our agriculture and the prospects of our fresh meat trade with Great Britain. In his report upon the agricultural colleges of the land, your own is chosen as best worthy description, and while he finds our agriculture some two hundred years behind that of Britain, he pronounces the college far in advance of similar institutions of his own country. Let not this seem like boasting, for there is nothing to boast of. We are simply trying to do our duty by the precious interests committed to our charge, and to serve with fidelity, not mere eye-service, in the task set us by the generous people of Michigan.

DESTRUCTION OF INJURIOUS INSECTS.

BY PROF. A. J. COOK.

[Delivered at Howell and Centreville Institutes.]

EXTENT OF INSECT DEPREDATIONS.

The subject of injurious insects, and the evil they do is indeed a portentous one; nor is it comforting to be told, though assuredly the truth, that the barriers which these insidious foes are rearing in the way of successful agriculture and horticulture, are becoming annually more formidable. It would be difficult in all the long list of our farm and garden products to find a single one that is wholly free from insect depredation, while many, and they often the most important, have a score of insect enemies to sap their vitality or work their utter ruin. It takes many millions of dollars each year to meet the demands of these ravenous hordes. Hence the interest which all our farmers wisely take in aught that relates to their overthrow.

Whether or not the art of agriculture is founded on science, surely economic or practical entomology rests wholly on scientific research. The varied economy in the structure, habits and transformations of insects makes prolonged study and wide knowledge imperative to the practical entomologist. A very considerable factor of this knowledge is based wholly on field work—long, hard, accurate observation of the insects in their native haunts when they are actually working their mischief.

DIFFICULTY OF THE STUDY.

Again, our insect enemies are counted by the thousands, and that practical knowledge requisite to successfully combat their noxious work demands large libraries, costly apparatus and prolonged study. In view of the extent and intricacy of this subject, no less than its practical importance, I have planned to formulate in this paper that part of our practical knowledge which bears directly on the remedy and cure for insect depredations, in the hope that it might assist the farmer and fruit grower to work intelligently and efficiently, even though they possess but a limited knowledge of the insects themselves.

INSECT TRANSFORMATIONS.

Most if not all of you know that insects are wondrously different in the successive stages of their development from the egg to the mature state. How seemingly wide apart are the maggot or larva of the meat fly, which so vexes the good housewife; the motionless, apparently lifeless seed-like pupa, and the buzzing fly; yet all are but different stages of the self-same insect. Our cabbage butterflies experience equally striking transformations. The caterpillar is green, wormlike and disgusting to the cook who attempts to prepare the savory vegetable for the noon-tide meal. The chrysalis is gray, inactive, and as it swings from its silken cord, would seem void of all possibility of future mischief. The butterfly is white, dotted with black, graceful of motion as it slowly wings its flight from garden to garden, and with its short sucking tube and frail body, would seem little capable of the serious mischief which it scatters with its tiny green eggs that it glues thick and wide to the cabbage plants.

DESTRUCTIVE LARVÆ.

Most insects, like the one just referred to, are only destructive while in the worm-like or larval stage. Thus the maggot of the Hessian fly or wheat midge is what robs the farmers' pockets often to the tune of millions. It is the caterpillars, not the moths, which as cut-worms sometimes destroy whole fields of growing corn. It is the white grub, not the May beetle, that causes the grass and corn to wither often for acres in extent. The wireworm or grub, not the parent snapping-beetle, is what blights the grain fields. The caterpillars known as army worms, not the graceful moths which only lay the eggs, are what devastate the oatfields, sometimes throughout entire neighborhoods, counties or even States. The same truth is illustrated in the orchard. The canker-worm, the tent caterpillar, the apple worm, the borers, the slugs are all larvæ of insects which in maturity would be entirely harmless, except that they laid the eggs, which hatched and thus gave rise to the terribly destructive larvæ.

DESTRUCTIVE IMAGO.

On the other hand, a few insects, like the destructive rose chafer, and the small but ravenous striped cucumber-beetle are most troublesome, often only destructive, when in the mature state. Other insects, like the Colorado potato beetle, which has worked such ruin in its devastating march across our country, and the bugs and locusts, are not content to feast and destroy only while in the larval stage, but continue their voracious habits, even to their death. Some of these insects, as illustrated in the western locust or grasshopper, do their very worst damage when in the mature state.

CLASSIFICATION OF INSECTS AS TO STRUCTURE OF MOUTH-PARTS.

Insects are *haustellate*, that is, provided with a beak or sucking tube; or *mandibulate*, in which case they have jaws which move sidewise and with which they grasp, cut or nip off their food. The *haustellate* group includes all mature insects of the *lepidoptera*—the butterflies and moths—and the *diptera*, or two-winged flies. If we except the biting flies,—it were more proper to say the piercing or stabbing flies,—like the mosquito, the gnat, the horse-flies and gad-flies, none of the above do damage while in the mature state. The bugs, too, which include plant lice, bark lice, bedbugs, most parasitic lice, and such arch destroyers as the squash bugs and chinch bugs, are throughout their entire lives *haustellate*. Such insects must, of course, pierce through the exterior and suck out the circulating sap or blood which serves them for nourishment; and could not be killed by applying poisons to the surface of their food. Therefore sprinkling plants with Paris green, hoping to kill the devastating plant lice or squash bugs, would be vain and fruitless.

To the second group—mandibulate insects,—belong all larval insects, that have their mouth-parts developed, if we except the larval bugs just referred to above, and all mature insects, with the exception of the moths, butterflies, two-winged flies and bugs. Such insects bite off and eat their food, much as the rabbit and woodchuck nip off and munch the bits of cabbage leaf. It is easily to be seen, then, that poison, dusted or sprinkled on the plants which are attacked, would of necessity be taken with the food and furnish a capital remedy.

A few insects like the Hessian fly, maggot, and the maggot of the onion, cabbage and radish flies have no mouths at all, and can only take their food by absorption.

CLASSIFICATION OF REMEDIES.

1. Give poison with their food. 2. Kill by applying irritants or poisons to the body. 3. Kill by mechanical means. 4. Prevent the insects from reaching the food-plants. 5. Prevent egg laying. 6. Capture and destroy. 7. Vary time of planting. 8. Practice thorough culture. Let us now consider these several methods more in detail.

USE OF POISONS.

It will be remembered that most of our insect pests are mandibulate, and as all such crop and eat their food, we at once see that to exterminate the pests we have only to scatter some insect poison upon the food plants. Hence all insects that eat the foliage from our trees or vines, or even eat the cuticle of the leaves as do many slugs and caterpillars, may be killed by this first method. We have only then to name the best poison, and the most practicable means to make the application.

PARIS GREEN.

Paris green takes first rank as an insecticide. From its virulency as a poison its use cannot be made universal. On vines and fruit trees, it should not be used if the tree and the shrubs are in fruit, except very early in the season. The color of Paris green, as also its insolubility, are greatly in its favor. From the first it is not liable to be mistaken for some harmless substance, and accidentally taken as medicine, or used in cooking. And from the second it is powerless to poison the soil.

Another arsenical poison, arsenite of lime, received from Hemingway & Co., London, and called by them London Purple, was tried by me the past summer with good results. This substance is much cheaper than Paris green, has a somewhat less favorable color, as it would be easily mistaken for some of the spices; but as it is readily soluble in cold water, I can not recommend its use in the place of the very insoluble Paris green. It will be in the market another season. Paris green is specially desirable in ridding our shade trees and shrubbery of caterpillars and slugs which may threaten their destruction, in exterminating insects like the potato beetle, which feed upon such parts of the plants as are not used for food, in fighting canker worms and other similar insects which attack our orchards before the fruit is much grown, and always in preserving trees and vines not in bearing.

HOW APPLIED.

These substances may be applied in the dry form, or mixed with water. In the dry form they may be mixed with flour in the ratio of one to eight, or with plaster in the ratio of one to fifty. If the first mixture is used it should be applied when the vines are dry, and the least possible amount used. The second may be best used when the dew is on, and a good quantity will not injure the plants. The first mixture is less apt to be washed off by heavy rains; the second is safer in careless hands. The application is best made when there is little or no wind.

In water about a table spoonful of the poison may be used to two gallons of the liquid. As this is only a mixture, and not a solution, care is requisite that this poison may not all settle to the bottom of the vessel. Frequent stirring will prevent this.

I would advise the use of the above to extirpate the potato beetle, the cucumber beetle—where it must be used with the greatest care so as not to injure the

vine—the canker worm, leaf rollers and the slugs and caterpillars that defoliate our evergreens, shade trees and shrubbery. On the border of a threatened oat field it might bring death to the army worm and relief to the crop.

HELLEBORE.

White hellebore is a less dangerous poison and in many cases quite as efficient as Paris Green. This is a vegetable poison, and is made from the root of the *Veratrum album*, a plant which grows abundantly along the slopes of the Alps. The powder is cheap, costing only forty cents per pound, while an ounce to two gallons of water will prove a deadly mixture to many of our pests. This is specially useful in combating the various slugs which attack our strawberry vines, raspberry, gooseberry and currant bushes, and evergreens. I emphasize its desirability in fighting the ubiquitous currant slug, which is aiming, with some show of success, to rob us of our currants, which means our best jelly and jelly cake. These blighting slugs do not all hatch at once, but come forth in successive broods. from the middle or last of May even to July. Hence several applications of the poison must be made, as many as the presence of the insatiate destroyers demands. Ignorance or neglect of this fact has led some to lose faith in this remedy.

Copperas in strong solution is a less efficient insecticide, which from my experience I cannot recommend very highly.

Persian insect-powder, the pulverized flower-heads of the *Chrysanthemum roseum* from India, is said to be an efficient poison and may well be tried in our experiments to rid our plants, our carpets and furniture and our domestic animals of noxious insects.

EXTERNAL IRRITANTS OR POISONS.

We have already seen that the *haustellate* insects, many of which are highly noxious, do not eat the plants but pierce through the cuticle or bark and suck out the nutritious sap. Though we are powerless to poison the food of such insects, we are still able to administer death by the application of external poisons. The best substances for such use are a weak solution of carbolic acid, a strong suds either of whale-oil or common soft soap and tobacco water. I have found that the addition of a half teacupful of crude petroleum to two gallons of either of the above makes them the more effective.

I have found the above substances peculiarly efficient in fighting slugs, cabbage worms,—in which cases they may also have acted as internal poisons, —lice on house plants,—where much care is required especially with the tenderer plants, or they will be injured by a too strong fluid,—plant lice, bark lice,—which latter are most susceptible just after hatching,—and the many lice and ticks which infest our domestic animals. In these last cases carbolic acid solution is very valuable, and should be freely sprinkled about the kennels, stables, and poultry houses. The tobacco water and kerosene are also very excellent. Persian insect-powder is also recommended highly by many dog and chicken fanciers.

Lime, ashes, and even road dust are destructive to some of the more tender skinned insects, especially to such as secrete a slimy viscid substance which covers their bodies, as do some of the slugs. Such treatment is quite satisfactory in case of the pear and cherry tree slugs. Dusting the plants with lime and ashes is often recommended as preventing the ravages of the various leaf-eating beetles. I have found these unsatisfactory.

DESTRUCTION BY MECHANICAL MEANS.

Many insects from their large size, like the tomato worm, and grape-vine sphinx, and others from their gregarious habits, like the tent caterpillar, fall-web worm, and red-humped caterpillar, are easily reached and crushed with the hand. A glove may make the work more pleasant, but no more thorough. All of the above except the first may be dispatched by use of a musket loaded with a light charge of powder, or by a torch at the end of a long pole, though not without danger to the trees attacked.

Other insects, like the borers and radish and onion maggots, are so out of reach that poisoning is impracticable. The first may be dug out and crushed, or crushed with a wire, while scalding with boiling water has been practiced successfully in destroying both the borers and maggots.

KEEPING THE DESTROYERS AT BAY.

Many cut-worms, from their habits of climbing trees and vines in search of the tender buds which they destroy, or plants to cut them off, are easily foiled by the gardener or pomologist. A band of tin about vine or tree is an impassable barrier to these terrible destroyers, which spend the day in the earth and go forth to their evil work when night and darkness serve them as a shield. Sized paper about cabbage and tomato plants, held close by a mound of earth, are an equally efficient barricade to the garden cut-worms.

PREVENTING EGG-LAYING.

To nip evil in the bud, has been the study and desire of philanthropists ever since the primal temptation. To secure against the egg-laying of injurious insects, is one of the ways.

The best, if not the only, way to accomplish this, is to render the plants obnoxious, so that the female insect shall pass by on the other side.

Thus washing fruit trees, especially young apple trees, with soft soap early in June, and again early in July, keeps the borers from egg-laying; and this is most desirable in orchard culture. Carbolic acid and kerosene mixtures, and even strong soap-suds either of whale oil or common soft soap, are valuable to repel the peach and squash-vine borers, the radish, onion, and cabbage flies, the cabbage butterfly, and I have much reason to think that frequent drenchings of an apple tree with strong soap-suds the past summer was an absolute protection from the codling moth. From my recent experiments, I think this one of the most hopeful fields for experiment in practical entomology.

HOW TO DUST OR SYRINGE PLANTS.

For dusting plants with Paris green, hellebore, etc., there are several patented machines, though I have yet to see a more convenient or easily managed appliance than a simple bag of muslin tied to the end of a broom-stick. To prevent waste while filling, this should be placed in the vessel which holds the powder, or in some other vessel,—a common milk pan serves admirably. To sift the powder onto the plants we have only to jerk the bag containing it, above them, gauging the force according to the amount of the substance which it is desired to apply. On small plants, like young potato vines, I think this the most economical method of applying the poison.

To use the liquid mixtures or solutions in a small way on low vines or shrubs, a common sprinkler with a finely perforated rose serves well, and requires no expense, except perhaps for a new nozzle, as the usual nozzles are too coarse.

For syringing trees, shrubs, flower beds, and house plants, I know of nothing comparable to Whitman's fountain pump. This little engine is so easily worked that a child can use it, and yet will throw a stream twenty or thirty feet high. The Johnston pump throws water faster than Whitman's, though not quite so far. This is a fine engine, and sells for $8.00. The Whitman fountain pump will not work well if pointed much below the horizontal, hence is not useful in sprinkling potato vines. It retails at $7.50. Lewis' syringe is an improved squirt gun of the kind made and used by children to amuse themselves. Replace the small alder tube with one of tin or brass, that holds three or four quarts, and the cloth wound piston by one of rubber, and you have it. It costs but a dollar and works well. In case of field potatoes, Ruggle's exterminator is probably the best. With this machine an acre can be sprinkled in hour. It consists of a large tank which holds the liquid. This, when in use is strapped on to the back of the person using it. An agitator which works inside the can keeps the mixture well stirred. This is moved by a strap which is fastened to the operator's arm. From either side of the bottom of the can, pass two rubber hose, each terminating with a fine rose. These are held, one in either hand, so that two rows are sprinkled at once. By raising or pressing the hose the flow is stopped. The only objection I found to the use of this was on the score of economy; though if the vines were close together in one direction, this would be small. For sprinkling large potato vines of field potatoes, this is the best instrument I have seen. It retails at $6.50.

TRAPPING NOXIOUS INSECTS.

Many insects if disturbed will fall to the earth. Therefore if we jar the trees or bushes which lodge the pests, after placing a sheet underneath, we may easily catch and destroy them. By this means the plum curculio can be cheaply destroyed, and one of our most valued fruits saved from almost certain destruction. The grape curculio, the blister beetles and the rose chafer, can all be caught in like way. In large plum orchards it pays to have the sheet stretched on to a frame in the form of an inverted umbrella, and carried by a wheelbarrow or cart. A slit permits this to pass immediately under the tree. The jar must be sharp, and to prevent injury to the trees or limbs, spikes should be driven in, and these, not the trees, should be struck with the mallet.

Some insects are wont to hide under boards, chips or rubbish. The plum curculio, early in the season, and the squash bugs and cut-worms are examples. Hence, if chips be placed under plum trees in May and June, they will be appriated for shelter and protection during the day, as the insects are nocturnal, and when thus hid the curculio may be easily gathered and destroyed. Neglect to gather them in before four o'clock in the afternoon makes the experiment only partially successful, as some may have gone to the tree to be on hand for the night's banquet.

Squash bugs are also nocturnal, and may be captured by placing old boards or wilted leaves on the ground among the vines. The similar habits of the cut worms suggests a similar trap. In this case some fresh mown grass is better for a trap. This placed in a cleanly kept garden a few evenings in succession before setting the plants will attract the marauders in quest of the growing plants. The next day the grass may be removed and the caterpillars crushed. The successful practice of any of the above methods makes perfectly clean culture imperative in orchard and garden.

THE CODLING MOTH.

Many insects, when full-fed, as larvæ, seek some crevice or other place of concealment in which to pupate. This habit of the apple worm—larva of the codling moth—has furnished us with the only successful method yet practiced for its overthrow. If cloth or thick paper bands be placed about the trees—they may be fastened with tack or string—these will, in the absence of rubbish about the trees and rough bark scales on the tree-trunks, attract nearly every larva that passes from the fruit. Some will leave the hanging fruit and crawl down to the band; others will escape from the fallen apples and pass up the trunk till the band is reached, when they will crawl underneath, spin their frail cocoons and become chrysalids. The bands should be in place by June 25. Should be examined by July 10, and thus on every 10th day till August 1, and again after the fruit is gathered. The best way to kill the insects is to loosen the bands and crush with the thumb. Four cents a tree would cover all expense, and by coöperation of all in a neighborhood it might be made even less. Will *you* neglect this longer?

Many insects like the chinch bug—happily not troublesome in our State—the squash bug, etc., hibernate in winter, crawling for protection under or into rubbish heaps, under corn stalks left in the field, etc. Burning up all such heaps in winter will not only cremate these pests, but add to the farmer's reputation for neatness.

It is well known that the chinch bugs and army worms, after devastating one field, march with merciless tread to another. Deep furrows or ditches are sometimes made about the threatened field, with steep side towards it, and as this becomes full of the migratory pests straw should be added, and all burned together. Trapping the codling moth in the cellar by having the windows all closely screened in May and June, and forcing them to tarry and die where they are impotent to do harm, is a wise precaution which should never be neglected.

DESTRUCTION OF EGGS.

The eggs of most insects are too small and inconspicuous to be easily gathered. In a few cases, however, this is a practical method. The clustered brown eggs of the squash-bug underneath the leaves are quickly seen. The yellow clusters of the potato beetle are conspicuous. The concentrated rows of the currant saw flies' eggs, along the veins of the leaves, are quickly discovered by the minute holes cut out by the earliest hatched slugs. The little green eggs of the cabbage butterfly, though obscure, are quickly seen with a little practice, and their riddance from small cabbage plants would afford useful employment for children.

In some cases early sowing of grain will help to avoid insects. This is true of the wheat midge. Late sowing or planting is sometimes successfully practiced with the Hessian fly, the cut worms, the pea weevil and the radish fly.

GOOD CULTURE.

It is almost superfluous to state that thorough culture, which means a systematic rotation of crops, ample fertilization, and deep tillage, will do much to insure against calamity from insects. Many insects choose the weakest plants, and it is a principle broad as nature that the strong will survive calamity, while the weak go to the wall. Grow only vigorous varieties, keep much stock, which means much manure. Apply this wisely and then till thoroughly, and you will do much to solve this whole question.

I can not leave this subject without a good word for the birds. They are a mighty host in this warfare. Even the robin, the jay and the grackel—though so often vilified—are the persistent friends of the farmer. Should we kill or drive off our feathered friends, we should only bid—and successfully, too—for the calamities which have visited the treeless and birdless plains of Kansas and Nebraska.

PARASITES ON DOMESTIC ANIMALS.

PROFESSOR A. J. COOK.

[Read at Howell and Centreville Institutes.]

I think that in all the vast realm of insect life, there are no other species so justly abhorrent and so miserably disgusting as the external parasites on man and the lower animals. Their very look is repulsive, their habits intolerable, in sooth they are fit companions of the dirt and filth which ever serve as the kindly foster-mother to these most repellant of animals. Well may the neat housewife start aghast at the sight of the nasty bed-bug, or blush with shame and confusion at the news that her own fond kin are nourishing those repulsive pigmies, the head-lice. The thrifty farmer also dreads the presence of these terrible blood-thirsty minions on his kine, for he knows that the prosperity of his animals is well-nigh impossible, if they must give of their substance to nourish these noxious pests of the barn and poultry house.

FLEAS, FAMILY PULICIDÆ, SUB-ORDER DIPTERA.

As the immature fleas live upon the organic matter of dirt and filth, these animals can only thrive as the companions of untidyness and neglect. Hence, we have more than one reason to congratulate ourselves that our State is not much troubled by these irritating pests. I have yet to see the human flea in Michigan. But, with neglect and filth, the dog, cat and hen fleas will put in an appearance even in our goodly State, and it is an unwelcome fact that these latter are nothing loth to take a sip from our own precious blood, if opportunity offers. The flea, structurally speaking, is a kind of nondescript among insects, and hence has been ranked by many able entomologists in a distinct sub-order—Aphaniptera. Others, and I think wisely, have regarded it as a degraded dipteron. The fact of its being apterous is certainly no objection to this, as all sub-orders have members that are wingless. The possession of labial palpi (Fig. 1, d.), which are wanting in all other dipterous insects, would seem a stronger reason for separation, yet such differences are not wanting in other groups. When we take into consideration their whole life economy, we are quite warranted, I think, in grouping them with our house flies, mosquitoes, bot-flies, etc.

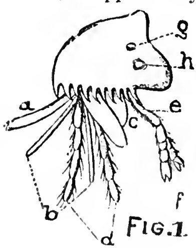


FIG. 1.

*HEAD OF DOG-FLEA.

[1] The drawings to illustrate this paper were made by Mr. Sherman Upton, student of the Agricultural College.

FAMILY PULICIDÆ.

The Family Pulicidæ, only includes fleas and the closely related insects, the curious jiggers, which are if possible still more degraded. These insects have only simple eyes (Fig. 1, g), a slim labrum (Fig. 1. a) or upper lip, while the labial palpi, usually absent in dipterous insects, are always present.

PULEX CANIS.

As all fleas are much the same, I will only describe the dog-fleas, Pulex canis (Curtis), which is our most common species. This species (Fig. 2) in common with all of the genus, is slim, and has a hard crust, hence the rapid transit of these animals, even through the densest fur, and their general exemption from hurt. The wings of all fleas are very abortive, and by the aid of the thickened thighs (Fig. 2d) of their posterior legs, they ever remain as champion jumpers. Their antennæ (Fig. 1, h) are three-jointed, and concealed in pits, just behind the simple eyes. The joints of the antennæ are broad, flat and lobed. The mouth parts are in general like the same in the mosquito, though they have the four-jointed labial palpi (Fig. 1, d) which are wanting in all other diptera. These organs form a firm but slender lance, by aid of which the insect is able to pierce the toughest skin, and through a tube formed by a union of these self-same parts, the blood is forcibly pumped up by a strong, muscular engine, their sucking stomach.

The dog-flea (Fig. 2) is so named as it prefers to satiate its blood-thirsty appetite from the dog. If dogs are permitted to harbor these annoying pests, the latter will gain admittance to houses, will hide in carpets, mats, etc., and anon, as occasion permits, will slake their thirst with human blood. A single flea may pierce and suck a half-dozen times in quick succession, and so agile are they that it seems to take them hardly as many seconds. "Biting as they run," they quickly inflict their painful wounds on various parts of the body. The color of the dog-flea is dark chestnut, darker than the human flea, and unlike the latter, it has sharp spines (Fig. 1) projecting from the lower lateral borders of its head, and the posterior edge of the first thoracic ring. The small, oval white eggs are laid on the animal, or in the dust of the kennel. The larvæ (Fig. 3) are footless maggots with lateral hairs, and live in dust and dirt where they feed upon the organic matter which these contain. They mature in about two weeks, when they spin their cocoons in which the inactive pupas may soon be seen. In two weeks more the mature fleas hop forth. There are several broods in a season. They pass the winter certainly as imagos or mature fleas, and perhaps in other stages.

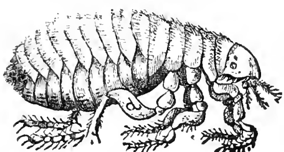


FIG. 2.
DOG-FLEA.

Pulex felis (Bouche), or the cat-flea, is very similar and perhaps identical with the dog-flea. Pulex gallinæ (Schank), or the hen-flea, infests the poultry house and attacks the hens. Other species live on pigeons, bats, etc. All of the species will test the quality of human blood, if opportunity offers. The fact that larval fleas love and only flourish in dust and dirt accounts for the lively appearance of the dust often noticed in poultry yards and about gardens, where the dogs, cats and

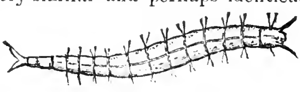


FIG. 3.—LARVA OF FLEA.

poultry lie or roll. From being seen in such localities, the mature insects are sometimes called sand-fleas.

REMEDIES.

To thrive, aye to live, the inchoate fleas must have dirt, hence cleanliness is a first-class preventive. The straw in kennels should frequently be burned and clean straw added. Frequent sprinkling of the poultry house and yard with a strong solution of carbolic acid will destroy the larvæ. I have found that a mixture of kerosene oil and lard, placed in three or four places about a dog, would immediately free it of the pests. A wash made by mixing one part of kerosene to ten parts of water, or three parts of carbolic acid to 100 of water, or a strong decoction of tobacco water, formed by steeping two pounds of tobacco in ten gallons of water, if applied to the animal and thoroughly rubbed in, will be completely efficacious, and do the animal no harm.

The Sarcopsylla penetrans, Linn., or jigger of the tropics, is a serious pest to the inhabitants of those regions. They feed, breed and live under the toe-nails, where they cause distressing sores, which in rare cases are so serious as to demand amputation of the part affected.

SHEEP-TICK.—(*Mellophagus ovinus, Linn.*)

This insect is a degraded Dipteron of the family *Hippoboscidæ.* Some members of the family, like the horse-tick or forest fly, have wings; but the sheep-tick is apterous. The body is not compressed laterally as is that of the flea, but from above. The head is not sunken, as stated by several authors, as will be seen by Fig. 4, which represents the head and its organs. The antennæ (Fig. 4, c) are minutes, sub-globular, and deeply sunken into pits. They are covered with very fine hair over their entire surface, while from the front project quite coarse hairs. It is stated by some entomologists that these organs are close together, which, as will be seen by the figure, is not true. The eyes, (Fig. 4, d) are long and narrow. The proboscis (Fig. 6, a) is plainly visible, and as long as the head, and is really a tube within a tube. The outer tube consists of two semi-cylindrical pieces (Fig. 4, b, b,) probably the mandibles, though some authors call them the maxillæ, which, when close together, form a very perfect tube (Fig. 6, a). Within these is the second tube (Fig. 4, a) which is twice as long as the other, though, when not in use, it may be so withdrawn as not to extend to the middle of the other tube. I have seen this inner tube protruded to double the length of the other while I have been holding the insects in my hands. This central tube (Fig. 4, a) consists of three pieces; one the larger—without doubt the labium—is grooved, and so receives the other slimmer lancet-like pieces—the maxillæ I think—as to complete the tube.

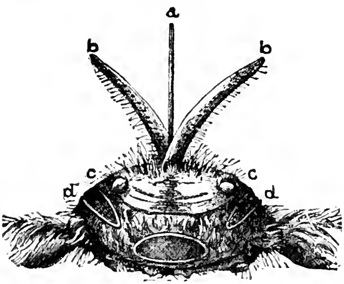


FIG. 4.
HEAD OF SHEEP-TICK—MAGNIFIED 25 TIMES.

These spider-like ticks move with equal facility forwards, backwards or sidewise. Their claws (Fig. 5, c) which terminate the feet, are sharp and strong,

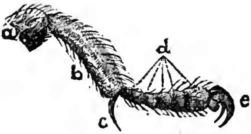


FIG. 5.
TIBIA AND TARSUS, WITH CLAWS.

and so toothed as to enable the insects to hold persistently to the wool or hair of the animals they infest. The insects of this family may almost be said to be viviparous. The oviduct of the female expands into a sort of uterus, where the one or two larvæ are developed. These are nourished by a kind of milk secreted by the inclosing organ. They pupate at once after birth, in the larval skin, which then assumes a brown color.

The sheep-tick, (Fig. 6) is a gray-colored, spider-like insect, about five-sixteenths of an inch long. The gravid female is lighter-colored, a little the larger and mottled (Fig. 6). The head is broader than the thorax, while the abdomen is rounded, leathery, and with no appearance of rings. In the axle of the legs on the femur (Fig. 5 *a*), near its union with the tibia (Fig. 5 *b*), are elongated, transparent areas, where may be seen a distinct pulse.

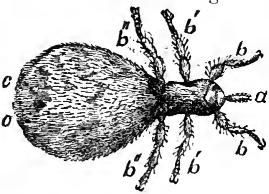


FIG. 6.
SHEEP-TICK, MAGNIFIED FIVE TIMES

Just back of each leg on the thorax, may be seen the stomata or breathing mouths. These spiracles extend along the side of the abdomen, not merely to the posterior lateral angles (Fig. 6, c, c), but even form a crescent on the posterior extremity about the vent.

FIG. 7.

The pupa (Fig. 7) is brown, spheroidal, and exhibits the two rows of spiracles very distinctly.

This insect is a serious annoyance to sheep and especially to lambs. It is note-worthy, that it attacks coarse-wool sheep much more seriously than it does the fine-wool breeds, and the long-wool varieties worst of all. This is doubtless owing to the less amount of oil in the wool of the long-wool breeds.

REMEDIES.

Prof. James Law recommends the following for ticks and also for scab: "Tobacco, 16 pounds; oil of tar, 3 parts; soda ash, 20 lbs.; soft soap, 4 lbs.; water, 50 gallons. Boil the tobacco and dissolve the other agents in a few gallons of boiling water, then add water to make up the fifty gallons. This will suffice for fifty sheep. Each sheep is kept in the wash for three minutes." One pound of tobacco steeped in five or six gallons of water is an effective cure. The lambs and newly-shorn sheep are to be immersed in the decoction. I have no doubt but that the kerosene and carbolic acid washes recommended for fleas would avail equally well for ticks. I do not think they would be too strong, as I have kept a poodle dog in such a fluid for some minutes without hurt, and I should expect a lamb or sheep would have no more tender skin than such a dog. Tobacco smoke is sometimes recommended; but it is difficult to make the application sufficiently thorough. To apply this nothing is better than the patent bee-smokers. The smoke should be thoroughly applied at least three times, at intervals of a week, that the pupæ may all develop, and the successive broods be killed.

LICE.

Among hemiptera we have, as external parasites, the nasty, disgusting and too common bed-bugs (Cimex lectularius, Linn) and the even more repulsive lice. As I am not treating at present of the human parasites, I will only say that the

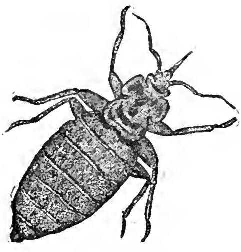


FIG 8.—BED-BUG, MUCH MAGNIFIED

bed-bug (Fig. 8), is exceedingly tenacious of life, as it has been kept in a glass bottle for years without food, and through all this long fast seemed to lose none of its activity or appetite. The best remedy for bed-bugs is a free use of the thoroughly rectified benzine. This will not injure bedding and is quick death to all the bugs that it touches. It should be poured into all suspicious crevices. Old houses that harbor these obnoxious pests should be closely shut up, and then thoroughly fumigated with burning sulphur, which becomes a fitting insecticide for the bugs. It would be better if the house were entirely empty during this operation. Thorough ventilation should succeed the fumigation.

LOUSE FAMILY—PEDICULIDÆ.

The parasitic lice (Fig 10) of man and other animals are apterous bugs. The head and thorax are small and narrow, the latter indistinctly segmented, while the abdomen is flask-shaped with its nine rings often plainly marked.

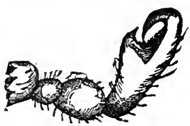


FIG. 9—FOOT OF OX-LOUSE.

The eyes are simple and very small; the antennæ five-jointed and prominent, while the tarsi or feet are two-jointed, the last joint of which (Fig. 9) is modified into a hook for grasping the hair. The sucking tube of lice —the *casus belli* of most of the hardest scratching of the world—is very complex and curious. The whole of this organ, when not in use, is drawn into the head. So all lice are criminals in the sight of the law and subjects for conviction, on the ground of bearing concealed weapons. The lower lip is thrown out, as we would push out the finger of a glove that was drawn in upon drawing the glove from the hand. Inside of this are numerous hooks which, when the tube is rolled out to its utmost, attain the outside and point back like the barbs of a fish-hook. When these barbs are pushed through a sweat-pore, each hooks on to the wall. We thus understand the tenacious hold which characterizes a louse while at dinner. When, preparatory to sucking, the hooks have been duly adjusted, two other tubes, one within the other, spy-glass like, are extended, the maxillæ forming the inner or terminal point of the extension, and the mandibles the remainder. The whole proboscis has been compared to an elastic probe. This is forced into the skin till it pierces the blood vessels, when by the forcible action of the strong muscular sucking-stomach, these irrepressible blood-suckers are enabled to take a quick meal.

There are three species of lice that disturb the peace and quiet of the human family. The head louse, (Fig. 10) Pediculus capitis (De Geer), is the most common. It is said that in olden times it was thought no disgrace, but fashionable and desirable, to harbor and nourish these crawling pigmies of the head; now they are only common among such people as neglect personal neatness. The most cleanly person may be so unfortunate as to possess specimens not pinned in an entomological cabinet, but he will soon banish them according to the fashion well understood in all civilized society. The grayback, Pediculus corporis (De Geer) is not confined to the head, and was the irritating pest of our brave soldiers in the late war. It is apt to be a source of annoyance in lumber camps and on ship-board. This species is so like the head louse in appearance that were not the habits so different,

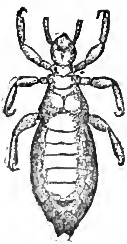


FIG. 10. HEAD-LOUSE.

we might almost regard them as identical. The Crab-louse (FIG. 11), Phthirius pubis (Leach) receives its common name from its close resemblance in form to the crab, and its specific name from the region of its attacks.

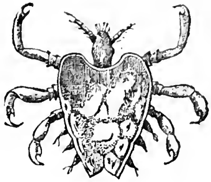


FIG. 11.—CRAB LOUSE.

Both of the last-mentioned may be banished by the use of a little mercurial ointment, which is a poison and should be used with care, or of kerosene and sulphur, which are to be applied to the part of the body attacked. As the eggs will continue to hatch for a time, the application will need to be repeated at intervals of six or seven days for two or three weeks. Cleanliness is the great preventive, which in this case is certainly better and vastly more pleasant than cure.

The genus Hæmatopinus includes, among many others, the cattle louse, H. vituli (Denny), (Fig. 12), the horse louse, H. eurysternus (Denny) the hog louse, H. suis (Leach), and the dog louse; H. piliferus (Denny). In form these are much like the common head louse. The five-jointed antennæ are stout, the eyes are very minute, the head obtuse in front, while the posterior legs are the longest.

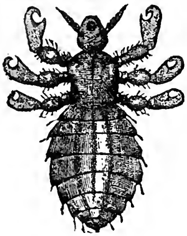


FIG. 12.—CATTLE-LOUSE.

BIRD LICE—MALLOPHAGA.

These lice, although the sucking tube is replaced by jaws, are nevertheless degraded Hemiptera or bugs. The body is flat and horny, the head is broad, the antennæ, four-jointed. Unlike other bugs, they have both maxillary and labial palpi. The species are very numerous. Nearly all birds have one or more species to annoy them, while the hen has five or six.

REMEDIES.

The washes already described for fleas are also efficacious in destroying lice. If the decoction of tobacco, or the kerosene and water, is to be used in cold weather on cattle or calves, especially the latter, they should be kept in a warm room, or well blanketed until thoroughly dry. If an ointment made of sulphur, lard and kerosene, be applied to the heads and under the wings of fowls that are annoyed with lice, the latter will soon disappear. The nests should be sprinkled with sulphur, the roosts washed with kerosene, the house and yard sprinkled with carbolic acid solution, and the poultry house frequently whitewashed. Persian insect-powder dusted onto, or rubbed into the hair and feathers of animals attacked by lice, will destroy the pests without harm to the animals. Ointments may be easily applied with the common brushes used in grooming horses. No good farmer or fancier will allow his animals to suffer from these enervating parasites, if he but knows of these cheap and effective remedies. During the past season I permitted my poultry and their house and yard to be overspread with countless myriads of these foes to comfort and prosperity—purposely permitted it—that I might learn by actual test, of the difficulty of procuring a riddance. In a few days after inaugurating the measures suggested above the disgusting pests were wholly banished. A little care will work entire prevention; while but little labor is required to work a radical cure.

SPIDER-TICKS AND MITES.

Some of you will remember an old-time disease, happily very rare in our

times, which, as surely as the traditional peck of dirt, would come to make its seven years' sojourn, not only in the best of families, but as the guest of the fairest. This disease, very appropriately christened the itch, of those—ought we say "good old times?"—was caused by the irritating presence of a wee animal, the itch mite. A near relative causes the mange, or scab, of our domestic animals, which are more polite terms of the same thing, the itch. The "red spider" or "red louse" of our poultry houses and the large wood ticks, whose bite is so painful to ourselves and the lower animals, are also near congeners.

ORDER ARACHNIDA, OR SPIDERS.

These tormenting pests are not insects at all, but belong with the spiders. They have only two divisions of the body, head and abdomen. Their eyes are simple; they are without antennæ, and when mature always have eight legs.

SUB-ORDER ACARINA.

The mites (Fig. 13) have rounded, non-articulated abdomens, can suck as well as bite, while many have at first but six legs.

The habits of mites are very varied. Some, like those in question, are parasitic; others, like the wee red spider, are very destructive to plants on whose juices they subsist. Still others, like the cheese and sugar mites, are destructive to the articles which give them their names. They are often met singly and as often in great numbers. A lady of my acquaintance has been much annoyed of late by noticing myriads of these minute creatures upon her windows.

IXODES (TICKS).

The largest of these animals are the ticks, which are often found on cattle that feed in the woods. Nor do the "wood ticks" confine their blood-thirsty attacks to our domestic animals, as many of us well know by painful experience. Often, as a boy, did I have to pay a painful penalty for those delightful strolls in the grand old forests, laid on by one of these same ticks, "Ixodes unipunctata" (Packard). One feels the darting pain, and upon immediate examination finds the cruel tick deeply buried, and so firmly anchored that the attempted liberation tears the head from the body. As a lad I wondered at this firm hold, but as I came to know the structure of the mouth organs, I ceased to wonder. Both their jaws and their glossoid or tongue are covered with teeth, each of which takes hold to prevent the extraction of its possessor. The ticks at first have but six legs. They are not enough of a pest in the Northern States to warrant a further consideration at this time.

The red mite (Fig. 13), which attacks our poultry in such alarming numbers, is the Dermanyssus gallinæ. It is soft-bodied, oval in form, and, though very small, is from its crimson hue, easily discerned without a microscope. The young have only six legs. I have found by actual experiment that they could inflict quite a painful bite, even upon our own persons. I have reason to believe that they may cause horses much annoyance, when the horse stable and hen roost are one and the same. The ointment made of sulphur, lard and kerosene works a speedy cure of this evil among the poultry. I have no doubt but that this same oint-

FIG. 13.—HEN-MITE MAGNIFIED.

ment or the kerosene wash would rid larger animals if attacked by these liliputian pests. Other species attack turkeys, pigeons, and even the cage birds of our houses.

The mange in horses is only another term for itch. It is caused by a small but visible mite, the Dermatophagus equi, which often swarms on horses. The D. ovis causes the scab in sheep, while the D. bovis affects in like way our cattle.

REMEDIES.

I have already given the cure recommended by Prof. Law for these pests. I presume the kerosene-wash, made quite weak, would also be effectual. The ointment made of kerosene and sulphur would certainly be a good remedy.

The itch mite, Sarcoptes scabei (Latr,) is so small as to be almost microscopic. It lives, feeds and reproduces its kind in small, subcutaneous galleries which its own feasting produces. As a consequence of the intolerable itching and the incessant irritation, disgusting pustules are formed, which are not things of beauty or joys forever.

A still smaller mite, the face mite, Demodex folliculorum (Owen,) lives in the pimples or diseased follicles about the chin and nose of the human face.

For all the parasites I have referred to, Prof. Verrill recommends a solution of sulphuret of potassium, two to four ounces to the gallon of cold water, varied to suit the character of the skin of the animal to be treated.

THE IMPROVEMENT OF GRAINS, FRUITS, AND VEGETABLES.

BY PROF. W. J. BEAL, OF THE AGRICULTURAL COLLEGE, LANSING, MICH.

[Read at Charlotte and Flint Institutes.]

The art of improving cultivated plants is very old, extending back two thousand, and perhaps three or four thousand years. The importance of planting good seed looks reasonable to every one. There is no good farmer of modern times who does not pay considerable attention to this subject, yet I hope to show that it deserves more attention than it usually receives, and to substantiate this assertion by presenting the results of many experiments made in Europe and in this country, and to add items of no insignificant importance taken from the experiments made at the Agricultural College. The subject is a difficult one to make popular, and it is too extensive to be well considered in the time at my command, but I hope for your kind attention, believing that most will be able to glean something new which will hereafter be of practical value.

The successful breeder of improved live stock gives careful attention to the selection of the parents for making his crosses. He does not neglect the matter of age, good condition, freedom from disease, food, drink, shelter, air, light, temperature and exercise.

In a manner very similar, the person who wishes to improve his plants must select with judgment. The parents must be healthy. Care must be taken to duly regulate their food, *i. e.*, the soil, air, moisture, light, heat and cultivation.

THE EXAMPLE OF THE FLORIST.

We select seeds of certain plants which come the nearest to our standard of perfection. No two breeders of any kind of stock have the same ideal standard in all particulars, so with those who improve plants. Our choice shorthorns, draft horses, Merino sheep, Essex swine, Light Brahma fowls were not brought to their present state of perfection by mere good luck or accident, but by the long and patient study and experience of able men. The same is true of many plants, more especially of plants which are raised for the beauty of their flowers or foliage. It is not by accident that our green-houses and gardens are so well supplied with choice roses, orchids, rhododendrons, azalias, camellias, pansies, petunias, phloxes, dahlias, gladioli, hyacinths, tulips, pelargoniums, calceolarias, asters, fuchsias, chrysanthemums. These and many others have been produced by judicious labor in breeding and cultivation. The poorest and those of medium quality were weeded out; only a few of the choicest were saved. The work was divided. One man devotes years of patient work to certain strains of pelargoniums; another to asters, roses, or pansies, and so on through the long list of "Flora's sweetest treasures." Burbidge says, "From a houseful of fuchsias, Mr. H. Cannel—who is well known for his new varieties of this favorite plant—only obtains about a quarter of an ounce of perfect seed, the value of which cannot be calculated, as it is never sold." One man raises 10,000 pelargoniums and each year for ten years or more, and only gets half a dozen a year fit to send out under a name, and many of these are soon replaced by others. Choice strains of cineraria and calceolaria and primula seeds are worth $50 or $75 an ounce, or $900 or even $1,500 per pound.

Great pains have been taken with many of our garden vegetables, notably peas, beans, cabbages, cauliflowers, beets, celery, melons, sweet-corn, lettuce, potatoes and squashes.

The above flowers and vegetables may have been much experimented on because of the quick returns which were likely to be made for an experiment. For the same reason much has been done to improve strawberries, gooseberries, raspberries and grapes. Considerable has been done with peaches, comparatively little with quinces, pears, plums, cherries, and in this country, almost nothing with apples. Some attention has been given to Indian corn, but very little to wheat, rye, oats, and barley.

POTATOES.

Some years ago potatoes rotted. Nearly every one thought we must give up this useful tuber. New varieties were originated and from those others were produced, and from the best of these still others and others in succession, until now we hear little about diseased potatoes in Europe or in America. From this I have taken a hint,—perhaps not the right one,—that we may raise up races of peaches which shall be healthy and strong enough to resist the yellows. Potatoes probably became degenerated by long propagation from the tubers (especially in unsuitables soils or climates), which are not the true seeds. Perhaps under favorable conditions this might have been continued indefinitely, but the conditions were not all favorable and the varieties became diseased, and by merely planting tubers could not be brought back to health and former productiveness.

Peaches are perpetuated by buds set in the young seedlings. The seedling makes a large growth the first year, nearly all of which is cut off the next

spring. All the force of vegetation is thrown into one bud set in the fall before. These abrupt changes may tend to make the tree tender.

Some peaches like the Barnard, Early Crawford and Hill's Chili, when grown by themselves are inclined to reproduce themselves. Let these peaches and others be repeatedly raised from the seed and those nearest like the parents selected for seed. After some generations of peaches we shall be able to raise each variety from seeds as surely as we now raise our varieties of wheat, corn, radishes, cabbages and squashes. To such permanent varieties we give the name of race to distinguish them from varieties which will not come true from the seed. Perhaps our earliest bearing pears might soon be brought into condition to reproduce themselves from seeds, and after a few generations regain strength to withstand the blight. At any rate, this is worth trying, and the experiment with peaches and pears has already begun at the Agricultural College.

VALUE OF GOOD SEED.

Peter Henderson speaks of offering an old man $50 per pound for some seeds of a certain kind of cabbage, but could not procure an ounce. The man kept his good seed, got ahead nearly ten days with his early cabbages, and made a little fortune by the operation. On another occasion one pound of seed purchased as Silesian lettuce, proved to be the curled India, and worthless for forcing. This was the most serious loss from bad seeds I ever encountered, amounting to at least $1,000.

Dr. Sturtevant in a recent number of the *Scientific Farmer* says that he had two varieties of seed corn, which presented an almost identical appearance of grain and ear. Yet planted on the same field in adjoining plats, the one yielded 55 bushels, the other 110 bushels of shelled corn per acre on the same manuring; and an unmanured strip alongside, planted with the better seed, furnished at the rate of 68 bushels of crop per acre. Gardeners pay great attention to the selection of their seeds. The farmer is apt to consider the seed used as of less account, and to ascribe differences in crops to the amount of manure used. "Manure and good seed, good seed and manure, neither without the other, and there will be a most cheering increase in the crop."

LOOK FOR SPORTS.

Those who have not seen it would be surprised at the care with which a florist or a nurseryman watches his plants. At different times during the year, he passes through and through long rows of plants, looking for sports or something new. He well knows that a good novelty will bring money to his pocket. The least difference does not escape his notice. These sports are watched, cared for, propagated and further tested. How many of our farmers are carefully watching their fields of wheat, corn, oats, for something new and better? They may learn a lesson from the gardener. Here certainly is a chance for good observers, and who dare say that even the farmer would not be benefited by a training in botany? Although agriculture is not my department, I have for two or three years past been much interested in looking through fields of ripe wheat to pick up all the varieties I could find, or any specimens of extra size.

CHANGING SEED.

The notion has long been quite prevalent among farmers that there is an advantage in changing seeds from one kind of a soil or from one part of a country to

another. In many portions of the southern States it is impossible to raise good potatoes without procuring seed from farther north, where they grow in greater perfection. In Central, and even in Southern Michigan, we all know that Dent corn is inclined to become earlier, with shorter kernels which become round at the outer end. To keep the corn near what it is, we must use especial care in selecting the seed or get seed occasionally from farmers south of us. In a climate and soil well adapted to a plant, it will thrive for a long time in one place, but I believe even there the same pains, with some change of seed, will produce better results. By this I mean that two men living twenty miles or more apart may each take great pains with his corn, wheat, etc. After a few years I think each man would be benefited by procuring seed of the other. I know that there are many cases which may seem in opposition to this idea, but I have seen so many cases of improvement in yield by a change of seed that I consider this subject of some importance. I quote the same idea from F. W. Burbidge, a recent English horticulturist of some prominence. He says "Cereal crops deserve more attention than they have hitherto received; and careful selection and judicious change of soil every two or three years would do much to improve these and other farm crops. One of the most universal and potent of these is cultivation and change of seed, which means a change of soil."

WILD PLANTS LIKE A CHANGE.

Plants which are indigenous to a certain region often—I may say generally—thrive much better when they are introduced into a foreign country. This is the case with many of our worst weeds. Some of them are much more thrifty, prolific and troublesome in our country than they are in their native country. The same is true in many parts of Europe and South America. To aid in securing this change of location, many plants are supplied with a wonderful variety of contrivances. This is familiar to all. The burdock has hooks to hold to hair or wool; the thistle seed (fruit) is floated in the air by a growth of down which acts as a miniature balloon; the seeds of pines have wings. Some float in the water. The pods of peas burst elastically and scatter the seeds. The fruit of the witch hazel shoots its seeds with considerable force. Birds and beasts eat seeds and fruits and distribute them for long distances. Nuts are buried by squirrels. Even insects and fishes contribute something to this work. Man exceeds them all in scattering far and wide, the good and the bad seeds. From these shall we not take a hint to remove seeds to new ground or new places? If wild plants like a change, why not those which are well cultivated?

LARGE SEEDS NOT ALWAYS THE BEST.

In selecting seeds something else must be taken into account besides large size, though when everything else is favorable, large seeds are probably the best. I could make numerous quotations to show this in case of beans, peas and other plants. With corn and wheat, I should prefer a medium-sized kernel from a large, fine ear, to a large kernel from a small, short ear.

GOOD CULTIVATION IMPROVES.

One of the best illustrationi in point is from Frederick F. Hallett, of England, and was reported in the Journal of the Royal Agricultural Society, 1861, page 371. He began by selecting the best spike of wheat he could find, paying especial attention to the quality.

Length.	Grains.	No. Ears on Finest Stool.
1857, original ear $4\frac{3}{8}$ inches	47	..
1858, finest ear $6\frac{1}{4}$ inches	49	10
1859, finest ear $7\frac{3}{4}$ inches	91	22
1860, ears imperfect from wet season	..	39
1871, finest ear $8\frac{3}{4}$ inches	123	52

"Thus," says Mr. Hallet, "by means of repeated selection alone in this short time the length of the ears has been doubled, their *contents* nearly trebled, and the 'tillering' power of the seed increased five-fold." This remarkable change was brought about in the following manner: The seeds were planted, one in a place, nine by nine inches. *The plants were well cultivated.* What does this amount to? From seed raised in this way a whole field of ten acres, in a very unfavorable year, yielded fifty-seven bushels to the acre, while with ordinary seeds on previous years the same land yielded from thirty-two to forty bushels to the acre. As we might expect, after continuing the experiments, Mr. Hallett found that the heads became more uniformly of good size and good quality and yielded well. Like a well-bred flock of sheep, where the owner had bred toward one standard, they were even and uniformly good.

HOW TO SAVE SEED WHEAT.

Of course we want to get the best variety of our soil and climate. The illustration above given supplies us with one mode of procuring good seed. Many of our farmers are quite particular to sow good clean seed wheat, and nearly all, perhaps all, would prefer such. How are the plump kernels selected? By means of the screens in the fanning-mill the kernels are separated. They come from all sorts of heads, long or short, large or small, from those shoots producing a few small heads, or from those producing many large heads. The seeds are selected at random from anything that may happen to produce plump kernels. There is, in this common practice, no attention paid to pedigree. Remember the longer a uniform good practice prevails in improving a grain, fruit or vegetable, the more firmly established does the improvement become.

HOW TO PROCURE SEED CORN.

I can do no better than to give a summary of a paragraph from my report for 1876. Plant a piece by itself, give plenty of room for each stalk; enrich the soil and give excellent cultivation. Remove all poor stalks before flowering that they may not fertilize any ears. I have followed this practice for two years. The Sturtevant brothers of South Frankingham have tried it for two years, and advertise seed corn in the following words: "Our seed is from fields from which all barren, imperfect, and undesirable stalks were removed before bloom, thus insuring a selection in the male as well as the female parentage." One of the brothers is editor of the "Scientific Farmer," which is one of the most able and progressive journals of agriculture in this country. In case of flint corn they have found about half of the stalks with a tassel and no ear. These barren stalks are mostly sprouts or what are commonly called suckers.

Florists follow the same plan by removing all poor or undesirable specimens before flowering, that no pollen may be transferred to plants from which they desire to save seeds. Seedsmen grow each variety of vegetable apart from others with which it is nearly related that it may remain pure and unmixed. Great care is needed to keep pure stock of our squashes, cabbages, cauliflowers, etc.

AN EXPERIMENT WITH YELLOW DENT.

Before leaving this subject I want to show you some corn which is the result of this experiment. In the spring of 1877 I planted a small piece of a small, early, eight-rowed, Yellow-Dent corn, called Yankee or Jersey Dent. In the midst of this piece I planted a single row of smut-nose, Yellow Flint corn. Before flowering, the tassels of the Flint corn were carefully and thoroughly removed. The Flint corn was a trifle earlier thon the Dent, so the fertilization of the Flint corn was imperfect. There was scarcely a full ear in the lot, but all that there was looked just like Flint corn. There was no sign of any cross with the Dent. This Flint corn, which I know was crossed, was planted by itself this summer, and here I show you some of the ears. There are all grades, from what looks like pure Flint corn to pure Yankee Dent corn. The pollen or male element produces a marked effect and should be attended to.

CROSS-BREEDING PLANTS.

There are some difficulties in explaining this clearly to any who have no knowledge of botany, but I will not go into details nor attempt anything which I cannot make plain. I have already spoken of the fertilizing dust or pollen, which grows on the top of the corn stalk. In squashes, melons, cucumbers and the like, the flowers are somewhat alike. The fertile ones are known by a large green bunch below the flower. This is the rudimentary squash, melon, or cucumber. The sterile flowers contain the pollen, and all fall off soon after flowering. Bees and other insects transfer the pollen, unless this is done by hand, as is usual when these plants grow in green-houses. In case of cherries, apples, peaches, currants and most plants, the flowers are said to be perfect, *i. e.*, they have the stamens and pistils near each other in each flower. It cannot be new to most of your that many plants, even those with perfect flowers, are much benefited by the visits of insects. The contrivances by which this is brought about are truly marvelous. In selecting the parents for a cross, the experimenter has some object in view. I will give an illustratrion. The tomaato called the Conqueror, is early; but considerably grooved. To remedy this defect I have crossed the Conqueror with the Smooth Red. In some of these seedlings I hope to find the good qualities of both combined. If I wanted to increase the size, I might cross with the Trophy. In crossing wheat we might wish to use the Clawson as one of the parents, on account of its vigor and productiveness. We should like a variety of Amber or Red wheat with the other good qualities of the Clawson. No one claims that there is much certainty in obtaining the results desired in a cross, but the chances for any result desired are greater when selections are made with reference to some one or two points desired.

Which parent exerts the most influence, or just what influence is exerted by each is a question not yet settled among experts. I think it may be well summed up in what J. W. Pierson of England says. He has given much attention to the subject and has made many experiments. He concludes that "some take after the male, some after the female; some after both, and some after neither; and that some kinds are goods breeders, and some are bad ones." After a cross is made it will take some years for the seeds to reproduce themselves—or to become a permanent or fixed variety—a race. The best we can do in this matter of crossing or hybridizing "is a game of chance played between man and plants."

On a previous page I gave some idea of the proportion of desirable plants

from a cross. From the Gardener's Magazine I learn that "Mr. Keynes, of Salisbury, sows every year and has done for many years past, 30,000 dahlia seeds, and has averaged about ten named flowers for the last twenty years or more—a small per centage, equal to one-thirtieth per cent." The late Mr. John Salter estimated that seedling chrysanthemums worth naming, averaged one in every 2,000 plants, or one-twentieth per cent.

I now come to what I consider the most valuable portion of my lecture,—the crossing with foreign stock. The particular topic is fully treated in a work by Charles Darwin. Although some regard him as a mere theorizer, such is not the case. He has done a great deal of valuable work by way of good experiments. The book touching this topic is called "Cross and Self-Fertilization of Plants." A review of the book, bringing out the leading points of value to farmers, was printed in the Scientific Farmer, of Boston, and afterward in the Michigan Pomological Report for 1877. Some hints on the subject were given by others previous to Darwin's experiments. As early as 1837 Dean Herbert said: "I am inclined to think that I have derived advantage from impregnating the flavor from which I wished to obtain seed with pollen from another individual of the same variety, or at least from another flower rather than with its own, and especially from an individual grown in a different soil or aspect." He adds, "It seems to me that this circumstance may be analogous to the introduction of a male from another flock or herd." I will now undertake the very difficult task of trying to give you the best ideas of Darwin's book referred to, introducing some of the experiments which were made.

CHARLES DARWIN ON FERTILIZATION.

There is weighty and abundant evidence, says Darwin, that the flowers of most kinds of plants are constructed so as to be occasionally or habitually cross-fertilized by pollen from another flower, produced either by the same plant, or generally, as we shall hereafter see reason to believe, by a distinct plant. Cross-fertilization is sometimes insured by the sexes being separated, and in a large number of cases by the pollen and stigma of the same flower being matured at different times. It is also insured, in many cases, by mechanical contrivances of wonderful beauty, preventing the impregnation of the flowers by their own pollen. Again, there is a class in which the ovules absolutely refuse to be fertilized by pollen from the same plant, but can be fertilized by pollen from any other individual of the same species. There are also very many species which are partially sterile with their own pollen. Lastly, there is a class in which the flowers present no apparent obstacle of any kind to self-fertilization; nevertheless, these plants are frequently intercrossed, owing to the prepotency of pollen from another individual or variety over the plant's own pollen. There are, however, some cases which seem especially contrived for self-fertilization. The number is much smaller than would be supposed by a hasty observation.

SOME CURIOUS EXPERIMENTS.

Many of Mr. Darwin's plants were raised from seeds which were sown at the same time near each other. The best young plants from the seeds of crossed flowers, and the best which came from self fertilized-flowers, were planted on opposite sides of the same pot, where the soil was well mixed. "In comparing the two sets the eye alone was never trusted." Fifteen plants of Indian corn from crossed seed exceeded in height fifteen others from self-fertilized seed, as 100 exceeds 84. He experimented with plants of the common morning glory

for ten generations, using the same number of plants from crossed plants as from those self-fertilized. The average in height for ten years is as 100 to 77 in favor of the crossing.

The flowers of this plant are freely crossed if left to themselves, exposed to insects. It is then, altogether likely that the seeds with which Mr. Darwin began were from crossed flowers, yet in the first generation, the seeds of crossed plants exceeded those self-fertilized as 100 exceeds 76. If we compare the number of seeds and capsules produced in the first generation, the crossed plants exceeded the others as 100 exceeds 64. The relative superiority of the crossed plants is chiefly due to their producing a much greater number of capsules, and not to each capsule containing a larger average number of seeds. When self-fertilized for nine generations, the flowers were of a uniform tint, as those of a wild species, while those in the beginning were of various colors. The crosses, so far mentioned of the flowers of Morning Glory, refer to crosses of different plants raised in the same garden, year after year. After nine generations he introduced seeds raised at a distance, under different circumstances. Plants from these were crossed with plants which had been intercrossed in his garden. This cross (called the Cochester-crossed) exceeds in height the other intercrossed plants of the tenth generation, as 100 exceeds 78. In numbers of capsules, they were to each other as 100 to 75, and the capsules, in weight, as 100 to 51, in favor of those crossed with foreign stocks. Here we get a most important fact, not learned by Mr. Knight, or any one else, that a cross from a fresh stock increases the size of plants and its fruitfulness, probably owing to their differing somewhat in constitution or character. *The crossing of closely related plants is generally an improvement over self-fertilization; but crossing with foreign stocks of the same variety is a far greater improvement.* The proof of the truth of the sentence in italics is worth untold sums to the raiser of vegetables, the florist, the pomologist, to the general farmer.

RESULTS WONDERFULLY FAVORABLE.

This is the great leading point conclusively proved by experiments cited all through the book. It towers above all others in such a way that it cannot be easily overlooked. There is need of many other experiments in the same direction in different portions of our country, and especially are experiments needed in crossing with foreign stocks all of our garden vegetables which store up nourishment in the roots, as beets, turnips, salsify, carrots, parsnips, radishes, and the like. Here is a new field not yet worked, and one well worth a good trial. In case of trees and shrubs, and other plants, too, it is an easy matter to have pollen sent by mail from a distance. The writer is trying this with apples and grapes. In case of the *Mimulus*, the third generations of self-fertilized plants were allowed to fertilize themselves spontaneously. Another lot were grown beside them from crossed seeds. "The crossed plants produced a large number of capsules, whilst the self-fertilized produced very few and poor ones." The seeds in the crossed capsules excelled those self-fertilized as 100 exceeds 34. Experiments were made with these two lots of seeds, showing "in a decisive manner the superiority in constitutional vigor of the crossed over the self-fertilized plants." The flowers of self-fertilized plants in the experiments made became more uniform than those which were crossed.

OBSTACLES SHOW QUALITY.

In comparing the crossed with the self-fertilized plants, Mr. Darwin usually placed one of each at the same time on different sides of the same pot. In

some cases, also, he places two lots of plants in crowded masses in the same pot or box. In the third generation of Petunia violacea, "both lots grew extremely crowded; the crossed were twice as tall as the self-fertilized." Other examples of a similar nature are given in the book. Mr. Darwin, in volume II. of his Animals and Plants under Domestication, says: "It is important that the two lots struggle with each other, for if sown with plenty of room and good soil, there is often but little difference in their growth." In other words, the self-fertilized are more easily overcome by surrounding obstacles. Like pampered animals, they cannot endure great hardships. In cultivating plants on the farm and garden, in many cases they are grown so close as to crowd each other. If so, seeds of crossed plants are generally the best, and most profitable to sow.

EARLY MATURITY GAINED.

I have said that plants crossed with a foreign stock were, in a great majority of cases later, larger, heavier, more vigorous, or better able to endure crowding by other plants. They also endure inclement weather better. In another respect Mr. Darwin has shown their superiority. In 50 cases the "period of flowering of the crossed and self-fertilized plants was recorded. In 44 of them a crossed plant flowered first either in a majority of the pots or in all; in nine instances a self-fertized plant flowered first, and in five the two lots flowered simultaneously. One of the most striking cases is that of Cyclamen, in which the crossed plants flowered some weeks before the self-fertilized in all four pots during the two seasons." In some cases, as with Lupinus luteus and Clarkia elegans, the crossed and the self-fertilized plants in height were to each other as 100 to 82, yet Clarkia flowered first. Numerous experiments showed that the crossing of one flower with that of another on the same plant, seldom if ever does any good.

EFFECT ON GERMINATION.

In twenty-one cases a record was kept of the relative period of germination of crossed and self-fertilized seeds. In one case the seeds germinated simultaneously: in ten cases the self-fertilized seeds germinated before the crossed, and in the other ten the crossed seeds germinated first. After knowing the great advantage to be derived from cross-fertilization, we are prepared to understand that honey is placed in flowers as wages to pay insects for serving the plants. The gay colors and odors are advertisements to call the attention of insects to the rich supplies of food in store for them. Saunders, of Canada, cut off the petals of raspberries, and by so doing made it difficult or impossible for the bees to find honey. "Almost every fruit which is devoured by birds presents a strong contrast in color with the green foliage, in order that it may be seen and its seeds freely disseminated."

A PRACTICAL SUGGESTION.

The seeds from a plant are benefited by the flowers having been fertilized by pollen of another plant which had been subjected to quite different conditions. This is brought about in many instances in the same spot where seeds have lain covered or dormant for some years, and then are turned up or placed in favorable condition to grow and mix with plants from seed produced in later years. Seeds are no doubt influenced by being kept for a long time. "Those which were matured during different seasons, will have been subjected during the whole course of their development to different degrees of heat and mois-

ture. It is a common practice with horticulturists to obtain seeds from another place having a very different soil so as to avoid raising plants for a long succession of generations under the same conditions: but with all the species which freely intercross by the aid of insects or the wind, it would be an incomparably better plan to obtain seeds of the required variety, which had been raised for some generations under as different conditions as possible, and sow them in alternate rows with seeds matured in the old garden. The two stocks would then intercross, with a thorough blending of their whole organizations, and with no less of purity to the variety; and this would yield far more favorable results than a mere exchange of seeds. Mix seeds of the same variety grown in different localities to grow your seed.

A PRACTICAL APPLICATION.

Brief reviews of this book reached me two years ago this January. Mr. Darwin had not tested the crossing of flowers by foreign stock in cases of our fruits, nor had he tried the same on but few of our vegetables. He had not tried it on any of the cereals except on Indian corn, and on this imperfectly, because corn will not ripen in the open air in England. It seemed to me to be the greatest chance ever offered to make some good experiments in this country for the benefit of our farmers.* I lost no time in trying this on several plants of widely different characters. I obtained pollen of the apple from Adrian, Lenawee county, by letter, and used it in crosses, which took good effect. I have some young trees one year old as the result. I also tried this experiment on two races of Indian corn, viz.: White Dent and Yellow Dent. I obtained Yellow Dent from Jacob Wolton, of Raisin, who got it from a man who had taken much pains with it and had kept it pure for ten years or more. I also procured some seed much like this from Benjamin Hathaway, of Little Prairie Ronde. He had kept it pure, and improved it for some fifteen years or more. I planted the Wolton and the Hathaway corn in alternate rows, in a patch by itself. I gave it good care. Understand me, I was not expecting to get a new variety, as these two lots were already nearly or quite alike. From the rows of the Wolton corn I cut all the tops as the tassels appeared. I secured a perfect cross. From seed thus saved were planted four rows through the middle of a field of Dent corn on the college farm.

In bushels of ears these four rows yielded a little over one-half as much as the sum yielded by six rows on each side. Or in other words, the yield from the crossed seed exceeded the yield of that not crossed as 153 exceeds 100.

I know of several men in different portions of the State who have mixed their seed corn and who think they have increased the yield by so doing. They have mixed different varieties, and have made no accurate experiments to determine the gain, if any, by this process.

RESULTS WITH CROSSED BEANS.

There were eight short rows, two feet apart, with the plants finally thinned on July 10 to five plants, about 15 inches apart in the row. The seed for half the rows (alternate rows) is called "old stock," and was raised in the garden the previous year from seeds which descended from those raised on the place for nine years or more. The "crossed stock" was obtained as follows: In

* The following reports of experiments with corn and beans was printed in the American Journal of Science and Arts for May. With reference to them Prof. A. Gray, of Harvard University, writes, "The experiments are very neat and to the purpose," and then he gives the article the place of honor in the Journal of which he is one of the associate editors.

1877 some seeds of the same variety of beans were purchased of James Vick. They were planted in a drill, evenly mixed with seeds of the old stock. They grew and looked alike, but the flowers were inter-crossed by the aid of bees. Seeds of this crop are termed "crossed stock." On May 31, 1878, fifteen seeds were planted in each of the eight rows. The plants from the "crossed seeds" were generally much the largest, and, as will be seen, kept green the longest.

In ten days after planting, seeds of the old stock came up in each row as follows	4	7	7	9—27
In ten days the crossed stock came up	12	10	6	11—39
In 17 days the old stock came up	7	11	10	10—38
In 17 days the crossed stock came up	12	13	10	14—49

July 22.—The pods fit for cooking on each plant were as follows:

Old stock	36	1	dead	7	13—57	
Crossed "	dead	0	0	41	0——	41
Old "	0	0	8	0	11—19	
Crossed "	6	22	34	0	17——	79
Old "	30	0	0	0	0—30	
Crossed "	41	37	21	31	0——	130
Old "	0	0	0	0	2— 2	
Crossed "	16	29	30	26	2——	103
Total old stock					108	353 Crossed.

August 9.—The pods fit for cooking or past that condition were as follows:

Old stock	52	60	dead	43	45—200	
Crossed "	dead	24	16	51	83 ——	174
Old "	38	46	44	71	37—236	
Crossed "	35	52	58	69	62 ——	276
Old "	39	34	30	47	87—237	
Crossed "	63	48	11	66	61 ——	249
Old "	38	46	54	33	39—210	
Crossed "	38	90	52	88	81 ——	340
Total old stock					883	1,048 Crossed.

On or before September 16 all were harvested. The pods on each plant numbered as follows:

Old stock	60	62	dead	45	39—206	
Crossed "	dead	160	54	20	139 ——	282
Old "	45	48	6*	71	37—237	
Crossed "	36	145	91	72	51 ——	395
Old "	45	35	37	38	35†-190	
Crossed "	103	68	55	128	75 ——	429
Old "	30	39	48	28	40—185	
Crossed "	136	159	58	172	128 ——	653
Old Stock					818	1,859 Crossed.

*This plant contained a dead branch with 21 immature pods.
†This plant contained a dead branch with 52 immature pods.

COMMENTS.

On comparing the table for August 9 with that for September 16, it will be seen that some plants of the old stock had lost part of their fruit. This was on account of the decay of 101 pods. The table also shows that two branches were broken and had died before maturing. These contained 73 pods. Adding 101 and 73 to 818, we have 992 pods of the old against 1,859 of the crossed. In harvesting, all those pods badly damaged were rejected. The beans of the old stock weighed 29.77 ounces avoirdupois. The beans of the crossed stock

weighed 70.33 ounces, or nearly as 100 to 236. The difference would be a little less if we allow for the broken plants and decayed pods on the old stock. One plant of the old and one plant of the crossed stock died early and produced no fruit.

COMPARATIVE WEIGHT.

Six lots of 50 beans early, were taken at random from the old stock and weighed as follows: 50 seeds, 281 grains; 50 seeds, 262 grains; 50 seeds, 270 grains; 50 seeds, 260 grains; 50 seeds, 259 grains; 50 seeds, 284 grains; total, 1,616 grains; average, 269⅔ grains.

The same number of seeds were taken from the crossed stock and weighed as follows: 50 seeds, 220 grains; 50 seeds, 219 grains; 50 seeds, 200 grains; 50 seeds, 210 grains; 50 seeds, 210 grains; 50 seeds, 220 grains; total, 1,279; average, 213 1-6.

The weight of an equal number of beans from each stock were nearly as 100 to 79 in favor of the old stock.

CONCLUSION.

All of these need to be repeated for years and the same thing tried on all of our fruits and grains, and vegetables. It is no ways likely that the results will always be alike favorable. But I appeal to you if the results as shown in the experiments with corn and especially with beans, do not look as though this was worth a fair trial. I hope you will try this carefully the coming summer, on some one thing and save the seed for next year. If the results are not favorable, do not blame me, for I only give you the details and results of a few experiments after a trial of only two years.

People are impatient for immediate results. If they make an experiment before breakfast they can hardly wait till night to know how it is coming out. The results of most experiments in agriculture cannot be reached with certainty without a long series of experiments extending often through ten or twenty years or more. The reason why it takes so long may be easily seen by observing the following words from Johnson's "How Crops Feed:" "A multitude of observations has demonstrated that from 95 to 99 per cent. of the entire mass (weight) of agricultural plants is derived directly or indirectly from the atmosphere." So much depends on the degrees and variations of moisture and heat and light, which are, at most, beyond our control; so little is furnished by the soil, that it leaves a large element of uncertainty as to the results after applying any fertilizer or adopting any particular mode of cultivation. Seasons vary. No two are alike. Heat, frost, sunshine, dew and rain are beyond our control. Soils and climates are unlike, so we have a broad field open for experiment and valuable results must come slowly.

Experiments of any great extent usually cost a person more time and money than he ever gains in return. If a favorable result is reached, the whole country is benefited. A person in attempting to improve any species of animal or plant feels that he is engaged in a great and noble business. He is a philanthropist, a benefactor of his race, and his works belongs on a higher plane than the work of a man who merely buys and sells, or who sows, cultivates and reaps just to make money.

DISCUSSION.

Dr. Miles said that he had experimented with Clawson wheat while at the College, and by selecting year after year he had obtained great vigor. He had wheat heads seven inches in length.

Secretary Baird said it was evident that this matter of improving seed by selection and cross-fertilization, was not merely curious and interesting, but also of very great practical importance to the farmer. The time was within the recollection of most of us, when it was quite common for farmers to think that they must sell out their cattle, sheep and other domestic animals and purchase a fresh lot as they inclined to "run out." That is just where we are now in regard to raising cereals. Every few years we introduce a new kind of wheat or oat to replace something that has done well for a few years and then "run out."

When a man has once fairly embarked on the enterprise of improving his stock of cattle, sheep or hogs by selection and importation, he would regard it as ruinous to sell out every few years and begin anew. When science has brought sufficient light to bear on this subject with reference to the various kinds of grain, we believe it will be regarded as an equally foolish and ruinous policy to allow suitable varieties to run out every few years.

If the results given in the lecture are approximately correct, it appears to me that the trouble and expense of improving and imparting a greatly increased vigor to existing varieties are trifling as compared with the profits to be realized from it. It is not therefore a work merely for the scientific investigator. He enters as the forerunner merely of the thousands who on learning what he has found will follow and reap a rich reward.

Mr. Davis asked for information in regard to whether it would be better to get seed from the north or from the south.

Dr. Miles said that he had collected corn from all quarters, and all experience showed that corn from the south took too long to ripen in this latitude. He recommended that oats for seed or for cross-fertilization be obtained from a cool climate, as there we found the heaviest and most perfect grain.

Hon. D. L. Montague, said he would like to have a record of failures as well as successes. He had raised 20 bushels of Norway oats from four pounds of seed, but after he had raised this kind for three or four years they were one-fourth smut. In the last ten years he had increased the yield of wheat on his farm one-third.

Mr. Dewey said he thought it would be difficult to obtain a perfect cross-fertilization as pollen was carried considerable distances by the wind and by insects.

REQUISITES FOR SUCCESSFUL FARMING.

BY R. G. BAIRD, SECRETARY OF THE STATE BOARD OF AGRICULTURE.

[Read at Flint, Howell and Dowagiac Institutes.]

It may appear somewhat presumptuous for one who has been principally engaged in other occupations, to undertake to instruct a body of practical farmers in the business to which they have devoted their lives. Yet farming is an occupation of such universal importance, second to none, if not really outranking all others in regard to utility and a more absolute necessity—that

there are many things connected with it of which we may have some knowledge without being farmers, and of which we may speak to those who are.

Agriculture has engaged in its pursuit nearly one-half of the working force of the nation, while the capital employed in it bears to the other industries nearly the same ratio. Another fact which more particularly distinguishes the agriculture of this country is, that the men who own the soil occupy and cultivate it. They are both laborers and capitalists; they are alike interested in the prosperity of labor and the protection of capital. This fact, namely, that we have an industrial class so numerous and representing so large a proportion of the nation's wealth, we regard as being full of encouragement not only for the progress of agriculture, on which it must exert an important influence, but also for the stability of the country, saving it from the destructive influence of those wild agitators who would array labor against capital and capital against labor.

Interesting as the subject might be, it is not, however the object of this address to dwell on the relation of the agriculturist to the body politic, but rather to consider a few things pertaining to the successful prosecution of his work.

In the title given to this address I have used the words "Successful Farming." I do not, however, wish to be understood as referring merely to that style of farming which may yield for the time-being the largest return in dollars and cents. This is no doubt an important consideration, but it is not the only one; nor is it in our opinion as important as some others. A farmer may so conduct his operations for a number of years as to show a considerable balance of profit, but the result may be that his land is impoverished to such an extent that years of unprofitable farming must necessarily follow. In such a case the so-called balance of profit has been obtained by reducing the amount of cash producing capital, for the fertility of the farm is what must be relied upon as the source of income. With land being year by year robbed of that fertility, the occupant has a most discouraging prospect before him. Slowly, it may be, but none the less effectually he is killing the goose that lays the golden egg. Every one who has any acquaintance with agriculture knows that the recuperation of impoverished and exhausted land is a slow and expensive process. Experience demonstrates that in the long run, the margin of profit is largest where the fertility of the soil is best maintained, by thorough cultivation and by applying those manurial elements which the growing of crops tends to exhaust. It is as foolish to suppose that you can improve your condition by impoverishing your soil as it would be to expect a rich return of milk, or beef, or wool, or pork from animals that you neglect and starve.

Again, a farmer may be making money, carrying on his operations, as most people would say successfully, while at the same time he is subjecting himself and his family to privations and discomforts for which the money he has made is far from being an adequate offset. Farmers as a class exercise an honorable frugality and industry, but when that frugality descends to parsimony or stinginess, it is as despicable in a farmer as in anyone else.

To rob your homes of comforts and the means of refinement for the sake of saving money is far from being a successful policy. The chief value of money lies in what it will procure for us in the way of physical comforts, intellectual and moral culture and social pleasures; in short, all those things that tend to enlarge our sphere of usefulness, multiply our resources of true enjoyment, and promote the growth of a noble manhood and womanhood. To the extent that we can afford these things there is no true economy in depriving ourselves

or our families of them. The isolation to which farmers and their families are necessarily subjected, as compared with those who live in cities and villages renders these home attractions a more absolute necessity.

The homes that furnish to the youth of our land their most joyous associations and the means of their highest culture constitute the most potent of all influences in the promotion of virtue, and the parsimony that would make home anything less than this is a false economy.

That which I regard as being most of all essential to successful farming, and as inclusive cf almost everything in this respect, is a knowledge of those natural laws and principles on which the farmer is constantly operating, together with skill or tact in the application of his knowledge in the performance of his work. The highest success in farming never was possible to ignorance, and as time goes on it is becoming every year more absolutely impossible for ignorance to succeed. The country that will henceforth command the markets of the world, whether with regard to manufactured articles or the products of the soil, is the country that can supply the best article at the lowest price. Since the days of international exhibitions, a wonderful impetus has been given to all industrial occupations. The aid of science has been universally recognized and called into requisition, economical methods have been made a matter of investigation and study, industrial schools, combining instruction in science and art are being everywhere established, ignorance everywhere lags behind, and intelligent labor alone can hope to reach the goal of success.

Farming was once almost exclusively the occupation of slaves, and then, while most exhaustive of physical strength, it could hardly be made to produce the bare necessities of life. How different the condition of the agriculturist to-day! His is now a profession enlisting in its aid the natural sciences and the mechanic arts, and in every branch of it developing and using the inventive genius of mankind. Unlike ancient philosophy, modern science is eminently practical.

"Philosophy," said Seneca, "teaches us to be independent of all material substances, of all mechanical contrivances. The wise man lives according to nature. Instead of attempting to add to the physical comforts of his species, he regrets that he was not cast in that golden age when the human race had no protection against the cold but the skins of wild beasts." Plato regarded science as merely furnishing amusement and exercise of the intellect, and in no way intended to be of any practical service in life. Even the science of medicine was regarded as purely an intellectual contemplation and not as something to be useful in healing the sick or strengthening the feeble. The science of legislation too was a mere abstraction having nothing to do with the prevention of crime or the reformation of criminals, or the building up of the people in the principles of patriotism, virtue, and honor. Modern science on the other hand aims to be useful. In place of teaching men to be independent of material substances and mechanical contrivances, it gives mankind such a knowledge of these substances and of all natural laws that they are no longer his masters but the servants that obey him. Science is no longer a mere intellectual abstraction. It is practical or it is nothing. It asks to be judged by what it has done to promote all sorts of human interests. While science has been doing so much to aid mankind in all other departments of industry, raising commerce and the mechanic arts to a position that our forefathers never dreamed of, it could hardly be expected but that it would invade the domain of agriculture. This it has done, putting us in possession of facts and disclosing to us laws that have changed the aspect of things in regard to this as much

as in any other known industry. Production has been increased—methods of preventing the exhaustion of the soil and even of increasing its fertility under this increased production have been discovered, implements have been invented which largely multiply the force and effectiveness of labor—the standard of comfort has been raised—old prejudices have been dispelled as darkness is driven before the light of approaching day. The farmer finds that he cannot afford to follow a method of culture simply because his father did. There is a demand for knowledge and skill in improving the capabilities of his soil in judging of the adaptation of different soils to the growth of grains, grasses and roots, and also for the improvement of the different kinds of domestic animals, hence in order to succeed the farmer must be an acute observer of nature's laws, and as no one individual can afford to experiment beyond a very limited extent, he must be somewhat conversant with the experiments of others and be able to note the results attained and conditions that secured them.

Still we sometimes meet with individuals who have a strong prejudice against what they call "book farming," but we have never been able to understand why books should be detrimental to a farmer, when they are universally acknowledged to be helpful to all other classes of men.

If you were going to engage a minister, you would not be likely to select one who had never studied theology, and who might boast that he had never read a book relating to those things in which he should be the instructor of his people. If you required the services of a lawyer you would probably employ some other than one who had never consulted books on law; and if you or any of your family were sick the quack who was ignorant of all books treating on the science of medicine is not the one whom you would be likely to employ in your eagerness to restore health or save life. In all these cases we want a man who is intelligent at least in the line of his calling because we recognize that such knowledge is essential to proficiency. Is it any less essential to the proficiency and success of the farmer that he should be intelligent in his particular line of work?

We know of no occupation in which a wider range of knowledge can be brought into practical use than in farming.

If the farmer knows something of veterinary, geology, chemistry, botany, and mechanics, such knowledge will constantly be of great value to him. His methods being more intelligent the results will be more certain, for his methods will be adopted with reference to the exigencies he has to meet and the adverse circumstances with which he has to contend.

In the education of our sons for farming we cannot place too great an importance upon thoroughness in the rudimentary branches of an English education. How much it adds to anyone's influence to be able to communicate ideas clearly and correctly by means of spoken or written language. The farmer who can thus communicate the result of his operations has abundant opportunity to scatter his ideas far and wide through the many agricultural journals, for the benefit of others. Thus cultured and equipped, he stands at the head of his profession and shows to all men what an honorable recognition it can be made to command. We can point to such farmers, and would that their number were multiplied an hundred fold. They are an honor to their country and their calling. You do not find them complaining that their land will not pay the cost of cultivation, or anxious to sell out and go west to begin over again on a new and unexhausted soil, where they must endure all the hardships of pioneer life. They are enjoying life's comforts and many of its luxuries where they are, and are content to remain. Educate your sons for

farmers as thoroughly as you would if they were destined for the bar or the pulpit or the medical profession, and they will rank as high in regard to usefulness, respectability, intelligence and wealth.

Whatever our labor may be, the more intelligence we can bring to it the less of a drudgery and the more of a pleasure it becomes. The man of thought, of advanced ideas, is always a leader among his class. His intelligent brain directs and controls the labor of other hands and makes that labor more effective than it would be without his guidance. From such a one our young men will not be likely to turn away with contempt for the occupation of farming, to engage in other and what generally prove to be more uncertain occupations. They will be encouraged to stick to the cultivation of the soil with a laudable ambition to become master workmen in their profession, believing that in *that,* as well as in any other, they can be an honor to their country and ornaments to society.

Permit me, in this connection, to speak of the sources of education open to those farmers who cannot now avail themselves of the aid of schools or colleges.

First among them I would name the agricultural press. Through this agency the opinions and experiences of our most advanced agriculturists in all parts of the world are collected and distributed at a very small cost to all who will receive. What an agency for good the agricultural press would be if the farmers generally took as much interest in a paper devoted to agriculture as they do in papers devoted to politics and general intelligence.

A paper in order to be largely useful must be liberally sustained; but unfortunately the greater number of farmers do not care to read the current literature of their profession as a doctor or a lawyer cares to read that of theirs. A farmer who lectured at one of our institutes last winter went to work to find what proportion of the families in his neighborhood took an agricultural paper. The neighborhood referred to was in one of the finest counties of the State. He found that not more than one family in twenty took such a paper. Now suppose that only one lawyer in twenty kept himself posted regarding the enactment of new laws, the repeal and amendment of old ones and the decisions of the higher courts, what would be the estimation in which we should hold the profession generally. Suppose that only one physician in twenty kept himself informed in regard to the progress of and discoveries in medical science, what would be the status of the profession, and what would be their competency to practice successfully? Think of a physician to-day treating fevers and some other diseases as they did when we were children, bleeding and dosing with calomel and jalap, forbidding the least drop of cold water while the fever lasted. We know very well now, or at least we think we do, that any one who survived such treatment lived because the fever and the doctor together couldn't kill him, and yet if men in that profession had not investigated and read they would have been in that miserable rut to-day. Do you suppose that a merchant would be likely to succeed who subscribed for no bank detector and price current, and whose buying and selling was governed by the merest whims? You know he could not succeed, and no more can a farmer in these days of railroads and telegraphs, and sharp competition and progressive intelligence afford to allow himself to drag along in the old ruts of the past. We must keep fully abreast of the times in order to prosecute successfully any profession or commercial business or any branch of productive industry.

One thing which I think has contributed much to hinder the advancement of knowledge in the department of agriculture, and so has been seriously detrimental to its progress, is a lack of sympathy and confidence between

scientific men and practical men. All manner of jokes, at the expense of one class or the other—are invented to keep up this alienation of feeling. One of these I noticed a short time ago represented a professor who had caught a mud turtle. As he was taking it home an old farmer asked him what he was going to do with it. The professor said he had some doves at home and he was going to cross them with the turtle and raise turtle doves. In the past these two classes of men have too much stood aloof from each other. The practical farmer has too often regarded the scientist who writes and lectures on agricultural topics with a feeling almost of contempt as a mere theorist; and the scientist no doubt has sometimes failed to come sufficiently in contact with the men of practice, and you know it is a fact pertaining to men everywhere, and in all relations, that we undervalue so long as we stand aloof from each other.

We must not forget that there is a class of men both in this country and in Europe, who, during the present century have done much for the advancement of agriculture who, in all probability would not know how to perform a single operation on the farm; yet the debt we owe to these men is beyond all computation. They have made investigations and established principles and facts that are invaluable to the agriculturist and to the world at large. Their investigations have lead to the discovery of fertilizers, and to a large knowledge in regard to their use and relative value. Through their genius and industry important principles have been applied to the construction of farm machinery, making the progress in this respect almost marvelous in our day, so that in many operations on the farm one man can do more than ten men used to do, and toil less slavishly than before. The work they have done in the respective fields of animal and vegetable physiology having given us improved breeds of domestic animals and a greatly enlarged and improved variety of grains, vegetables and fruits. On the other hand we have practical men who can perform all kinds of agricultural operations, who cannot understand how one grain of wheat will sprout and grow, and how another lying beside it will not grow.

It is so in other occupations, there are and must be men of science and men of practice, the one class is essential to the other, and while one cannot fill the position of the other and is not possessed of the same kind of knowledge, each may be efficient in his own department. One man knows how to construct a locomotive and another man knows how to run it. So one man applies his knowledge of mechanics to the construction of a reaper or a threshing machine, another man knows how to use one or both. One man applies his knowledge of vegetable physiology and gives the farmer an improved variety of grain or fruit, and another sows, plants and reaps.

The improvement of agriculture and the development of its resources require that these two classes of men come together more than they have done. The scientific man must not ignore the practical man, but recognize him as a fellow worker in the same cause, and the practical man must learn to respect the opinions of the scientific man just as he does the opinions of other professional men in their particular line. There is and can be no real antagonism between science and practice in farming. The one is the demonstration of the other. Science discovers and suggests and practice performs,—or if practice discovers science explains and records the discovery.

To some extent our agricultural fairs are educating farmers in regard to the importance and value of scientific agriculture. In what is there placed on exhibition it can be seen what some of the natural sciences have done, in what

they can furnish in the form of scientific principles wrought out and made manifest in the various kinds of implements and machinery. These machines appeal to the judgment as the application of scientific principles to the securing of a practical result. An individual, it is true, may fail to see the principles involved, or he may doubt the efficiency of the machine; he may call it a new fangled notion and prefer to work in the old way, but he only thus confesses his ignorance as he is likely to be afterwards forced to admit when he has seen it operate on the farm of his more enterprising neighbor.

It has been by the most rigid and persistent application of scientific principles that we have come into possession of the improved breeds of cattle, horses, sheep, hogs and poultry, whose well developed and symmetrical forms make them the objects of admiration at our agricultural fairs. If a farmer, impressed with the vast superiority of these animals as compared with the scrubs he has been raising, buys a pair and takes them home, but ignorant of those scientific or physiological laws, attention to which originally secured the improvement, in the neglect of these laws he soon finds a marked deterioration in the progeny of his improved stock. In his disappointment at the result of the investment, he pronounces it a humbug and a failure, whereas the failure is attributable directly to his ignorance. Whatever sins of omission or of commission agricultural societies may have laid to their charge, they have at all events accomplished a very important work in awakening a more general interest in agricultural and other productive industries. In bringing before the eyes of the community the best results attained in the improvement of all kinds of domestic animals, fruits and cereals, also the progress in the mechanic arts as applied to farming implements; they have enlisted the sympathy of men and women of intelligence and thought, and raised labor to high position of honor and respectability. Make your local society all that it can be made as an educator and exponent of the most advanced ideas in agriculture and domestic embellishment and comfort. Guard it against all that would detract from its noble aim and depreciate its real value. Let its managers bear in mind that it is neither a horse race nor a circus, but an agricultural exhibition, and it will be patronized and upheld, not by idlers and jockeys, but by the industrious, frugal, enterprising men and women of the county, and the progress you exhibit from year to year will exert a wide and lasting influence that will be seen and felt in the order and management of many a farm, and in the increased attractions and adornment of many a rural home.

In looking around to discern the signs of the times, I do not know of anything more full of promise for the future or more clearly indicative of present progress than the holding each winter in different parts of the State a series of "Farmer's Institutes." Attended as these meetings are by the most intelligent and wide-awake farmers in the vicinity, and by the professors of our Agricultural College, where each takes part in the presentation of lectures and essays, and participates in the discussions that follow the reading of these papers, the practical farmers and the men of scientific knowledge are brought into closer and more frequent contact.

Having attended most of the Institutes that have been held under the direction of the State Board of Agriculture, I can speak somewhat confidently of the influence they are exerting. It used to be said that there was no kind of meeting that interested so few of the farmers as a meeting for the discussion of agricultural topics, and I suppose this was true at one time, but it is not so now. With scarcely a single exception these institutes are largely attended by

a wide-awake, intelligent class of farmers, who invariably manifest a live interest throughout the proceedings.

Year after year these meetings are growing in interest and usefulness, and through the published reports they are disseminating a large amount of valuable information among the farmers, which is directly in the line of their work. The contact into which the farmers and professors are thus brought is eminently beneficial to both,—each feels that he has much to learn as well as something to communicate.

In the past the complaint has been that you could not educate a young man without educating him away from the farm. That when the farmer's son goes to college he is not likely to go back to farming. It was hardly so much as expected that he should think of farming when he became a scholar. That so many of our brightest, most cultured and enterprising young men turn aside from farming to find occupation in other pursuits, is a fact to be deplored. One chief cause of this no doubt is to be found in the circumstances and associations of their early life. Unattractive rural homes, where everything is reduced to the most hum-drum, commonplace, matter-of-fact style of living, where to the desire to lay up something for the future all present comforts and attractions are sacrificed, methods of conducting operations on the farm which allow no scope for intelligence and thought; these have produced an intense dislike in the mind of many a youth for farm life and work. Don't be afraid of a small investment in ornamental trees and shrubs and flowers, or of the few hours' work necessary to grade and sod a lawn about the house. Both the future and the present will be richer in regard to all true riches for the outlay that will make the home attractive both inside and out. Make it a place that the children will be loth to leave, and when they do leave it, as many, of necessity, must, they will always regard it as one of the greatest pleasures of their life to return to it again. So conduct your operations on the farm that the young will always feel their need of knowledge and realize the constant opportunities which their occupation gives for putting it into practice.

Do not teach your children to think that other occupations are easier, pleasanter, and give to labor a richer remuneration, for such is not the case. It is not surprising that so many youth have turned away with a feeling of dislike from an avocation which they have been taught to regard as having nothing better to promise them than ceaseless care and a life of unremitting and poorly remunerated toil. If they had been taught the reasons for and the conditions which render necessary the operations they performed, and if, when they manifested a taste for reading and acquiring information, they had been encouraged not to direct their energies to other pursuits, but rather to look at the splendid field open to them for the application of scientific knowledge to farming, we can hardly estimate how much would have been gained. Honor your occupation as farmers. Teach others to respect it by respecting it yourselves, and remember that in this, as in all other callings, our success in the long hereafter will be measured, not by the money we have made, but by the good that we have done.

BEEF AND BEEF BREEDS.

BY PROF. C. L. INGERSOL.

[Read at Charlotte and Howell Institutes.]

The end of all cattle is the shambles. This is a fact pretty well understood, and unless disease of some kind or misfortune overtakes them, every farmer undertakes to bring his surplus cattle to the butcher's block. Our cattle may be divided into dairy breeds and beef breeds. This division is not an arbitrary one, as one class merges into the other, and nearly all breeds are kept for milk as a present consideration, while they are afterward fed for beef. Two questions then arise, "As to whether we shall keep that breed of cattle which shall make the most beef, and take whatever milk yield may come with it; or, 2d, Whether we shall keep that breed which shall give us the best milk yield through a series of years, and then make whatever beef we can after that."

In other words, shall we make beef first or milk first. These are questions that cannot be readily answered, either affirmatively or negatively. Only relative answers can be given, and each farmer must decide for himself after a thorough canvass of his peculiar circumstances and surroundings. There is one question that should come home with force to each one of us, viz.: Cannot I do something to improve the animals I have now in my possession, and care for them better? When once we have asked ourselves this question seriously and with a desire to do something, the work is well begun, and one great reason why there is so little improvement of stock is, that the real desire for it does not exist. When such desire does exist, many go at work blindly to accomplish it. This reminds me of the farmer correspondent of a certain journal who wrote asking if they had ever heard of crossing cattle and buffaloes; saying that a certain paper said it had been done and the cross-bred animals had many of the characteristics and valuable properties of both. The answer of the editor was quite laconic and right to the point, "We have often seen common domestic cattle which in our opinion would have been considerably improved if crossed with the buffalo—or anything else."

What are the beef breeds?

There are four breeds that are generally considered as the beef breeds, viz.: The Short-horns, Herefords, Devons, and Polled Scotch cattle, and the various persons who are interested in these breeds never seem to tire of pushing their claims forward for their favorite breed. The Short-horns in numbers seem to have the preference in Great Britain, and also in America, while the Herefords are close behind them if not equal in results reached where close competition has been allowed. Many of you are doubtless aware of the honors carried off at the Paris exhibition by Mr. McCombie's Polled Scots, and that they were taken in competition with some of the finest Short-horns and Herefords. This may seem to point to some of the difficulties these breeds will have in the future, to hold their place in the fat stock shows of the old world. For the encouragement of those who feel that they cannot afford to go to the expense of buying pure bred animals of any particular breed, we have this to offer: that in many instances in the show ring the successful animal has been a grade, and that

even in the fat stock show in Chicago, which has but recently occurred, the animal that won the first and sweepstakes prizes, was a grade Short-horn steer, bred and owned by Mr. Gillett, of Elkhart, Ind. In order to show you that these honors fall somewhat promiscuously, I quote an extract from the "Country Gentleman," giving the report of results at the Birmingham fat stock show, held November 30, 1878: A Short-horn four-year-old heifer won the president's prize, "for the best animal of any breed or age, bred and fed by the exhibitor," in competition with one of Mr. McCombie's Scots. The most successful beast of the occasion, however, was a cross by a Short-horn bull on a polled Scot cow, to which was awarded the challenge cup, together with £15, as best in his class, £50 as best in a series of classes, and 100 guineas as best in all the cattle classes—say $850 cash. He was 4 years and 10 months old, and weighed 2,844 lbs. The first prize steer in the younger class of cross-breds was got by a Short-horn bull out of a Jersey cow, and was as well grown an animal as any in the hall, and without a superior for a firm and mellow touch. "A big rambling American bullock" is mentioned as having a good chine an d carrying some meat on him, "but bare on the shoulder and flat-ribbed."

This gives us some idea of the show at Birmingham and its results for this year. While on this part of the subject I wish to refer to the Smithfield club show, that is to England the acme of all livestock matters in beef-production, and is quoted as the great show, its decisions carrying corresponding weight with them. In the Agricultural Gazette (published in London) in a December number, 1875, is given a complete summary of prizes won from 1807 to 1875 inclusive. I present a condensed statement of the same. In 1807–8 the first prize was won by a Hereford ox. The show was abandoned until 1830, when the nature of the first prize was changed; it was then given "to the best beast in any of the classes." For the next fifteen years, including 1844, the prize was won twelve times by Short-horns (Durham's), twice by Herefords and once by North Devons. For thê thirty-one years following, viz.: 1845 to 1875 inclusive, two first prizes were offered—one for the best steer or ox in any class and one for the best heifer or cow. Sixty-two prizes were thus distributed in the following proportion: thirty-eight to Short-horns; one to Herefords; seven Devons and three Scotch Polled cattle. Crosses: one each of Short-horn crossed with Devon, Scotch, and Hereford blood; also one Hereford and Long-horn cross. The last seven years there was a champion plate given to the best beast in the yard irrespective of age or sex. This was won six times by Short-horns, and once by a Polled Aberdeenshire. This makes a total of eighty-six prizes given, of which fifty-nine were won by Short-horns and Short-horn crosses, sixteen by Herefords and Hereford crosses, eleven by Devons and others.

This report carries with it considerable significance when we know that the object of this show is "to supply the cattle markets of London and other places with the best and cheapest meat." To aid in this and to give decisions that are valuable, the judges are instructed in forming their judgment "to have particular regard to the quality of the flesh, lightness of offal, age, etc." This show is held in the second week in December, and in time for the butchers to purchase their supplies of animals for the Christmas market. The importance of the show to the whole people can be somewhat estimated from the number of people who visit it. In 1873 over one hundred thousand (103,643) were admitted to the exhibit and a greater number in 1878. In order to prohibit animals from being exhibited again and again, rules are adopted restricting them. The following is a short recapitulation of the rules as published

in the National Live Stock Journal in 1873. "Every exhibitor must own the animal exhibited at least six months previous, and no animal can take more than one prize except a medal, and cannot compete again in the same class. No exhibitor can make more than one entry in a single class, and each entry must be accompanied by a certificate giving names of owner and breeder together with pedigree as far as known, the age, the kind of food upon which fed and prepared for the show. A breeder's certificate must accompany this to corroborate the age. These certificates are open to challenge, and when challenged, proof must be brought to substantiate them. If found false the exhibitor is forever disqualified from exhibiting at the shows, and all stock bred by him is ineligible to entry in any of the classes."

This furnishes the officers and judges data from which to work, and informs the people in the reports, of what has been done with certain breeds, and how they have been cared for in order to produce the best results. You will also see by this that reasonable precautions are taken to secure honesty in exhibitors and judgment unbiased in the judges, and from the results and awards as published we are led to suppose that these were distributed as they were earned.

Let no man deceive himself in regard to this matter and think that in any one breed lies all excellence, under all conditions and with all attending circumstances, or that this excellence may always be found in one of the pure breeds. We have seen that sometimes it may fall among the fine and showy Shorthorns; at others it is with the grand and beautiful Hereford or Devons, and again it may be found with the black and homely Polled Scots (as they are often termed), or high grades of either of the foregoing breeds or their crosses.

But while we are looking to see what animals are excelling in beef production, let us pause and see in what this excellence consists! Let us see what the ideal may be, toward which we are to direct our attention in our future work.

Excellence in a beef breed may consist in the particular excellence of the beef, or animals themselves, or in the excellent results given when fed for beef. Some of the excellences to be noted in the animal will be, smallness or fineness of bone in proportion to carcass or weight. This is one of the things sought after in breeding animals for beef, while in close connection with this we should aim to get all the size we can without coarseness. Coarseness in an animal shows a poor quality of beef and an animal that will not feed to the best advantage. Closely following this is attention to the form of animals, choosing such as will give a large return of the best parts of beef and a corresponding small return of neck, brisket, shank and other poor parts. While looking to squareness of form, breadth of chine and loin depth, etc., we must, be on the guard and see if we cannot avoid an immense development of the abdominal contents. This adds nothing to the value of the animal, but on the contrary detracts much from his value. The animal, then, that will dress the greatest net weight of good beef to the given live weight is the animal sought after. This varies much in different animals, and somewhat in different breeds. In general terms, cattle that will dress 60% of good beef are considered as good beeves. Some fall under and a few go over that per cent. The Hereford grade exhibited by Mr. Miller at Chicago was sold to Mr. Drake, dressed for the Christmas dinner at the Grand Pacific hotel, and netted 67.09% of his live weight. The remarks of the committee, as quoted by the "Live Stock Journal," are quite significant on this point. It says: "Some of the animals in this class (steers four years old and over, all breeds and grades included), were patched with fat and were uneven. The great majority had good backs and thick loins, were fine in bone and head, with short necks; as a rule they were

low, blocky, heavy-set cattle, with solid mellow flesh. Some had too great a proportion of fat to cut to advantage and profit. This was particularly noticeable in the older steers, in which the proportion of fat and cheap, inferior flesh to the valuable portions of carcass, was too great to give the butcher any profit or the consumer the best quality of well-marbled flesh."

The first choice was the Short-horn steer and next was the Hereford grade, which, however, would dress more net weight than the other.

After having paid attention to the foregoing points in selection for beef, the next point to be considered is the selection of animals that will make a good, thrifty growth. Considerable attention has been directed toward this of late, and the report of the Fat Stock Show in Chicago has a table of weights and ages, showing in connection the daily average since birth. There is this slight discrepancy, in that the weight at birth is not taken into consideration, and to be strictly accurate this weight should be deducted to show the true average gain.

Table of ages, weights, and average gain of each animal per day since birth. (Report of fat stock show, Chicago.)

Age in Days.	Weight, lbs.	Average gain per day.	REMARKS.
1880	2085	1.11	Short-horn Steer.
1902	2440	1.28	" "
1280	2115	1.65	" "
1220	2060	1.69	" "
969	1705	1.76	" "
978	1600	1.64	" "
650	1480	2.28	" "
670	1275	1.90	" "
1721	2075	1.20	" Cow.
1188	1285	1.08	" "
1245.8	1812	1.45	Averages of 10 Short-horns.
2692	2010	.75	Hereford Steer.
1336	1705	1.20	" "
1356	1760	1.29	" "
1080	1470	1.36	" "
1677	1595	.95	" Cow.
2092	1715	.82	" "
1705.5	1709.2	1.00+	Average of 6 Herefords.
1658	1645	.99	Devon Steer.
1652	1870	1.13	" "
1371	1655	1.21	" "
1267	1475	1.16	" "
1487	1661.2	1.12	Average of 4 Devons.

Age in Days.	Weight, lbs.	Average gain per day.	REMARKS.
2058	2750	1.69	Grade Short-horn Steers.
2033	2830	1.79	" " "
1328	2185	1.65	" " "
1298	2305	1.78	" " "
962	1885	1.96	" " "
962	1560	1.62	" " "
656	1420	2.16	" " "
701	1520	2.17	" " "
1249.75	2056.87	1.64	Average of 8 Grade Short-horns.

Table of Baker & Shearer, steers sold in Lansing. (From Lansing Republican.)

Age in Days.	Weight, lbs.	Average gain per day.	REMARKS.
626	1225	1.96	Grade Short-horn Steers.
606	1200	1.98	" " "
582	1100	1.89	" " "
614	1160	1.89	" " "
607	1171.25	1.93	Average of 4 Grade Short-horns.

Table of animals on college farm in growing condition,—not fed for beef.

Age in Days.	Weight, lbs.	Average gain per day.	REMARKS.
737	1433	1.94	Short-horn Bull.
139	364	2.60	" "
570	854	1.50	" Heifer.
342	682	2.00	" Steer.
447	833	1.87	Average of 4 Short-horns.
1323	1462	1.10	Devon Steer.
1323	1310	.99	" "
1323	1386	1.055	Average of 2 Devons.
708	880	1.24	Galloway Heifer.

There are a few lessons that we may draw from a consultation of these tables, and perhaps one of the first is, there is something in the breed of an animal, and that the ordinary farmer who is content to turn off his steers at two or three years old, weighing from seven to nine hundred pounds, is not up with the times and is not getting as good returns for money, feed and time invested as the one who can make his steers weigh 1,200 pounds at the same age, with the same effort. The breed that will mature the earliest then, other things being equal, is the most profitable one for the farmer to keep. From the results given in the above tables we see that good results may be obtained from almost any of the breeds when well handled; always remembering that the smaller animals as a rule, consume less food if they have less record of weight.

The lessons of the table would be more instructive if we could know the history of each animal from birth to the date of the show, and thus know just how it had been cared for and fed. In remarks accompanying, a few are noticed:

Nos. 7 and 8, of Short-horns, were not stabled, and only had pasture, hay and corn, about 65 bushels each.

The 7th prize steer, more than three-fourths Short-horn blood, had never been under shelter, and had been fed corn and a few oats in the pasture.

Another lesson from this show and these tables is, that we cannot afford to keep beef animals until they are four or five years old. The average of increase falls quite rapidly after three years, and the feed consumed is much more in proportion. Even if kept and made very fat it scarcely pays, as the fat will be scattered too much and not of value.

The question may possibly arise as to the policy of shutting up these steers that have been used to the range of fields. You may possibly think as I have thought, that better results than these might be reached if they were shut up and stall-fed. Without arguing the question, I give you the deduction made from experiments at the Illinois Ind. University, under the direction of the lamented W. C. Flagg. After feeding lots of steers in various ways, he gives this result:

"Seven steers in barn, average 1.45 lbs. per day, and seven in yard, 2.36 per day." Those in the barn received the better feed and care. He says that these steers were of the common stock of the country, and showed more or less of improved breeding. "As to methods of feeding and feed," the report says: "I am satisfied that in this climate, and with cattle we buy here,—never having been handled,—that the best and cheapest mode of feeding is to feed shock corn in a sheltered yard." "Three things are essential: Good cattle to feed, plenty of food and water, and a place to lie down out of wind and snow."

We have a State in which we are peculiarly favored. It is filled with mineral wealth; we have an untold wealth in our forests, and in the area after settled; we are not confined to any one line of farming. We are sometimes styled a wheat-growing commonweath, and I fear we are too much so. But as our State grows older we see a healthy development in almost every branch of stock production, as well as in those productions obtained directly from the soil. It is now estimated that the cattle in our State will not vary much from 350,000.

These are divided between the dairy interest and the beef interest; each diverse from the other to a certain extent, but in the end merging into one.

It has been estimated by good authority that the average age of all our cattle is five years (some say four years); if this be true (and I have little doubt but that the estimate is a fair one), what changes might be wrought in a decade by using pure, blooded sires of one or another of our best breeds of cattle. In the time mentioned if there were no increase in number of animals turned for beef, Michigan farmers would be producing nearly one-fourth more beef, and receiving from one-fifth to one-third more in price for the animals sold.

This can come as part of a fixed plan and in connection with a regular rotation recognizing the fact that the manure produced is of considerable value to us now, and will be of more value as our state grows older.

I expect to be met by the cry of over-production and glutted markets, but on this score I believe we need not fear at present if we only raise our standard of quality in the productions sent abroad. You will pardon another allusion to the Smithfield show, in this connection, in the remarks of the Agricultural Gazette. It says:

The presence of the American oxen shown by Messrs. Bell of Charterhouse Square, and of the Danish animals, has told what keen competition all producers of any meat, short of the very best, must prepare themselves to face. The American cattle were below the best Scotch or English beasts, *but not below any except the very best;* and the Danish contribution (although not up to the American standard) so far exceeds what the Danish cattle used to be, that this suggests, not less than the Americans do, to those who are disposed to be laggards in breeding, some very uncomfortable thoughts of being undersold. Messrs. Bell's oxen would quite equal the average English animals.

Here then is one outlet at least which has been open for a short time, and from present appearances promises to last a long time. The prophecy that was made in 1873 in regard to our export trade and the possibilities in regard to the shipment of dressed meats have been more than realized. The table of exports in the Report of Bureau of Statistics, Treasury Department, gives as animal exports, *i. e.*, animals, their products and articles manufactured from them, 1874, \$99,000,000; 1875, \$104,314,988; 1876, \$113,941,509; 1877, \$140,564,066. In 1876 the live cattle exported alone amounted to 1,110,703; in 1877, 3,414,411. Right in this connection, however, we are met by the argument that although there is a strong and increasing export demand, yet the great West and Southwest can more than fill this call, and thus we shall have no business to try to compete with them.

We are, perhaps, met by the statement which is very probably true, that Chicago has handled \$5,000,000 more value in live stock of all kinds in 1878 than in 1877, and that at such rate of increase, overproduction must surely follow. They probably neglect to look at the fact that a cheapening of meats increases the home consumption, and also that there is an increase from the increase of population and a gradual spreading of trade. This spreading of trade is shown quite as much in the receipts as the sales. It shows a larger territory tributary to and dependent upon that market.

There is one point that I would not have Michigan farmers overlook, and that is, that with such early maturity as we ought to have in our animals turned off, together with the lessened distance for transportation, there is no reason why we cannot compete successfully with the cattle men of the country west of the Missouri. Especially should this be true when we take into consideration that ours is but part of a system well regulated, and of which the cattle

are but a single factor, while with them it is their whole business or very nearly so.

In conclusion then, let me say, that we should keep and feed the stock even though we do not expect extraordinary profits; as the fertilizer question will soon stare us in the face if we do not. After this resolve, then see to it that whatever is raised and fed, is taken care of so as to make as rapid daily increase as possible, remembering that "whatever is worth doing at all is worth doing well."

REPORT OF THE SECRETARY OF THE STATE AGRICULTURAL SOCIETY FOR THE YEAR 1878.

DETROIT, MICH., *February 1, 1879.*

R. G. Baird, Esq., Secretary of the State Board of Agriculture:

Sir,—I herewith transmit to you the reports of the transactions of the Michigan State Agricultural Society for the year 1878, with the proceedings of the Executive Committee with which that body closes its year, for publication.

Yours very respectfully,

R. F. JOHNSTONE, *Secretary.*

OFFICERS FOR THE YEAR 1878.

President—W. L. WEBBER, East Saginaw.
Secretary—R. F. JOHNSTONE, Detroit.
Treasurer—A. J. DEAN, Adrian.

EXECUTIVE COMMITTEE.

Terms Expire December 31, 1879.

ABEL ANGEL, Bradley, Allegan County.
D. W. HOWARD, Pentwater, Oceana County.
H. O. HANFORD, Plymouth, Wayne County.
F. M. MANNING, Albion, Calhoun County.
A. F. WOOD, Mason, Ingham County.
F. V. SMITH, Coldwater, Branch County.
W. M. FERRY, Grand Haven, Ottawa County.
J. Q. A. BURRINGTON, Vassar, Tuscola County.
D. T. DEWEY, Owosso, Shiawassee County.
J. WEBSTER CHILDS, Ypsilanti, Washtenaw County.

Terms Expire December 31, 1880.

GEORGE W. PHILLIPS, Romeo, Macomb County.
E. W. RISING, Davison Station, Genesee County.
JOSEPH M. STERLING, Monroe, Monroe County.
W. A. KIPP, Highland, Oakland County.
W. H. COBB, Kalamazoo, Kalamazoo County.
HENRY FRALICK, Grand Rapids, Kent County.
A. O. HYDE, Marshall, Calhoun County.
D. A. BLODGET, Hersey, Osceola County.
PHILO PARSONS, Detroit, Wayne County.
WM. BALL, Hamburgh, Livingston County.

Ex-Presidents—Honorary Members of the Committee.

G. C. MONROE, Jonesville, Hillsdale County.
M. SHOEMAKER, Jackson, Jackson County.
JAMES BAILEY, Birmingham, Oakland County.
H. G. WELLS, Kalamazoo, Kalamazoo County.
W. G. BECKWITH, Cassopolis, Cass County.
W. J. BAXTER, Jonesville, Hillsdale County.
GEO. W. GRIGGS, Grand Rapids, Kent County.
CHARLES KIPP, St. Johns, Clinton County.
E. O. HUMPHREY, Kalamazoo, Kalamazoo County.

STANDING COMMITTEES.

COMMITTTEE ON BUSINESS.

J. M. STERLING, Monroe. A. O. HYDE, Marshal. F. M. MANNING, Albion.

COMMITTEE ON FINANCE.

HENRY FRALICK, Grand Rapids. F. V. SMITH, Coldwater.
E. W. RISING, Davison Station.

COMMITTEE ON TRANSPORTATION.

J. M. STERLING, Monroe. HENRY FRALICK, Grand Rapids.
W. H. COBB, Kalamazoo.

COMMITTEE ON PRINTING.

PHILO PARSONS, Detroit. W. H. COBB, Kalamazoo.
Secretary R. F. JOHNSTONE, Detroit.

COMMITTEE ON RECEPTIONS.

PHILO PARSONS, Detroit. W. G. BECKWITH, Cassopolis.
M. SHOEMAKER, Jackson.

COMMITTEE ON PROGRAMME.

A. O. HYDE, Marshal. A. J. DEAN, Adrian. F. V. SMITH, Coldwater

COMMITTEE ON LOCATION OF FAIR.

The President, W. L. WEBBER, East Saginaw.
PHILO PARSONS, Detroit. J. M. STERLING, Monroe.
HENRY FRALICK, Grand Rapids.

COMMITTEE ON RULES.

J. W. CHILDS, Ypsilanti. W. J. BAXTER, Jonesville. F. W. MANNING, Albiou.

COMMITTEE ON PREMIUMS.

E. O. HUMPHREY, Kalamazoo. G. W. PHILLIPS, Romeo. WM. BALL, Hamburgh.
A. O. HYDE, Marshall. E. W. RISING, Davison Station.

PROCEEDINGS OF THE EXECUTIVE COMMITTEE OF THE MICHIGAN STATE AGRICULTURAL SOCIETY.

FIRST DAY.

MICHIGAN EXCHANGE,
DETROIT, January 13, 1879.

The regular annual meeting of the Executive Committee of the State Agricultural Society was held at the Michigan Exchange, Detroit, on Monday evening, January 13, 1879, President Humphrey in the Chair.

The roll was called by the Secretary, and the following members answered to their names:

President Humphrey, Treasurer Dean, Secretary Thompson, and Messrs. Angel, Burrington, Dewey, Hanford, Howard, Manning, Smith, Webber, Wood, Ball, Cobb, Fralick, Hyde, Kipp, Parsons, Phillips, Rising, Sterling, and ex-presidents M. Shoemaker, W. G. Beckwith, W. J. Baxter and E. O. Humphrey.

The resignation of Wm. L. Webber as member of the Executive Committee was presented and accepted.

On motion of Mr. Hyde, Wm. M. Ferry, of Grand Haven, was elected to fill vacancy.

President Humphrey read his address and invited the President elect to the Chair.

THE ADDRESS OF PRESIDENT E. O. HUMPHREY.

Gentlemen of the Executive Committee and members of the State Agricultural Society:

In retiring from the position of President of this organization, which it has been my privilege to occupy for the past four years, I desire to say to you that it is with most sincere satisfaction that I review the history and progress of this society. It has steadily and surely grown in its exhibit of animals and articles, in visitors, in receipts and in interest and influence from year to year, until to-day I do not hesitate to say that it is on equal footing with any State society on this continent, and I hope and trust that this unprecedented success shall give such encouragement that you will continue your efforts to the end, and build up this Society to a still higher standard of excellence and usefulness. The treasurer's report will show the Society to be in good condition financially. You have a handsome balance in the treasury, and I hope you will endeavor to keep this surplus good and increase it. For on that the society must rely greatly for its strength to encounter bad weather and an unsuccessful fair, which will be likely to overtake you sooner or later.

The question of locating the fair permanently has been discussed and recommended by some. But it is very clear to my mind that it would be bad policy to do so. For I fear should that be done it would be a damaging blow to the society. There would unquestionably be societies organized in other parts of the State as district or opposition fairs, which would detract very materially from this society. It would then be the society of the whole people no longer. And I am thoroughly satisfied that the only way to keep the people in all parts of the State interested in the State Fair is to hold it in more than one locality.

I will not attempt to make suggestions as to the future management of the fair, but will leave that to my more able successor.

Gentlemen of the committee, I take pleasure in being able to say that during these

years which I have been associated with you, I believe it has been your greatest pleasure and desire to do all you consistently could to promote the best interests of the society, and have each and all discharged the various duties assigned you faithfully and well.

And I wish here to make special mention of him who has acted as chairman of the business committee during these four successive years. You know as well as I that it is seldom you can find the man that would or could give the time to any public enterprise that Mr. Sterling has done for this society, and it is still more difficult to find the man that could do it as well. For this large amount of labor, skill and energy combined, it is not expected we can remunerate him. But I do believe we all feel like presenting him with our testimony in some way as evidence of our recognition and appreciation of this extraordinary work, and would suggest such manfestation by the committee.

In behalf of the officers I tender the most earnest thanks of the society to the citizens of Detroit for their liberal contributions in money and their efforts in other ways as a contribution to the success of the fair. And to the Mayor and Council for their kindness and assistance in perfecting arrangements for the fair; to the railroad for their liberal arrangements and other acts of courtesy; and to the press for their generous donations in advertising the fair, who have each and all performed their part nobly in making the great fair of 1878.

It is with deep regret that I announce the death of one of the board—an ex-President of the society, Hon. Charles Dickey, who died at his residence in Marshall last evening. He was president of the society in 1858 and 1859 and, while he lived, ever regarded with great interest its welfare and was always ready to aid in making its exhibitions a success. The members of this society will miss, with regret, his pleasant face and kind greetings at their annual gatherings. He was one of the pioneers of Calhoun county, and with him it was both duty and pleasure to aid in the development of the agricultural interests of the State. I recommend that this committee pay a proper tribute of respect to the memory of our late associate and friend.

Gentlemen, it has been my aim and desire throughout to discharge the duties of my position in such a manner as would advance the best interests of the society, and I earnestly hope it may have met your approval. I think it probable I may have committed many blunders. But I can assure you I am unconscious of committing any intentional errors, and whatever success I may have met with, I am satisfied very much it is due to your uniform kindness and assistance in trying to make these duties as free from embarrassment as possible; and for this kindness and consideration on your part I certainly have great reason to thank you. I now vacate this chair with the greatest pleasure for him you have chosen to fill it.

INAUGURAL ADDRESS OF PRESIDENT W. L. WEBBER.

Gentlemen of the Executive Committee:

Less than thirty years ago, in March 1849, when Michigan as a State was but twelve years old, the then Governor, State officers and members of the Legislature at Lansing, recognizing the value of Michigan for agricultural purposes, and the importance of Association for the development of that interest, formed the Michigan State Agricultural Society. Gov. Ransom was made its first president and Lieut. Gov. Fenton was one of its officers and delivered the first address under the auspices of the Society.

The gentlemen connected with this organization were the representatives of the people; they knew and appreciated the value of the undeveloped territory in the State, and they were then laboring to secure the most rapid development of its agricultural capabilities. The act to incorporate the society was passed at the same session and still stands unchanged as the organic law of the Society. The State made annual appropriations for several years in aid of the society, and its proceedings were published as public documents at the expense of the State. Essays upon subjects of interest to the farmer were prepared and published with these proceedings.

The object of the society as stated in the organic law, and which had been previously stated in the constitution, was and is "for the purpose of promoting the improvement of agriculture and its kindred arts throughout the State of Michigan." A careful examination of the writings and sayings of its founders shows that the idea entertained by them as to the best means of accomplishing this object, was the dissemination of information concerning agriculture, and its kindred arts. They recognized that "knowledge is power" with the farmer as well as with others.

Among their first efforts to that end was the project of an agricultural school

One of the ablest arguments in favor of such an institution is found in a memorial to the Legislature, which was prepared by Bela Hubbard for the committee of the society, and under its resolution, and presented to the Legislature in 1850. The Society continued its labors in this direction to success; and after the agricultural school was established, the library which the society had previously gathered was donated to it. After its establishment, the society used its influence to procure from Congress a grant of lands in aid of the institution, and in its proceedings we find that a memorial was directed to be prepared and submitted to Congress asking for such an appropriation. The efforts of the society, coupled with others in the same direction, resulted in the passage by Congress of the act of 1862, which gave to the college 235,673.37 acres of land, to be selected and sold, and proceeds to be used for the benefit of the college. A recent report shows that there were of these lands unsold Sept. 30, 1878, 161,647.75 acres, all lying in the Lower Peninsula and north of the correction line which extends east and west across the State, between townships 20 and 21 north. This society having no selfish purpose, no design to gratify personal or local pride, but being formed solely with a view to the general good, whatever tends to promote such good must rejoice the heart of every one of its true friends. That the college has done much for the dissemination of information among agriculturists is not now an open question, not only in educating the students who visit the institution for instruction, but through its professors in the dissemination of information by lectures and essays, and lately, and in a most effectual manner, by the inauguration of farmers' institutes which are being held in different localities throughout the State, and in which, I am happy to say, a great interest is manifested, and which cannot fail to do in the future, as they have done in the past, great good. Every organization, whether local or general, which has for its object the promotion of agriculture and its kindred arts, must receive the cordial sympathy and support of this society. All such are co-workers in a common cause, and the most cordial relations should exist among them all. Each bearing in mind that the general good only should be the aim of every member, whatever may operate most effectually to produce that end, no matter from what source emanating, should be cordially seconded and endorsed by all. In this connection I suggest whether it would not be wise for the Executive Committee to meet once, or oftener, each year, at the College, that the members of the Executive Committee may become personally familiar with the workings of the institution, and able to state from their personal observation, concerning its management and its advantages, and may also be able, by friendly suggestions, to render assistance to the Board of Agriculture and the officers of the College, should any points be observed wherein good in that direction might be accomplished. I have no doubt the authorities of the College would cheerfully grant any facilities for such meetings that might be desired. It should be our aim to keep constantly in view the objects of our society. As stated above, it was by its founders regarded as an educational institution. Those of us who for the time being are charged with its management should be careful that in all things it educates wisely and well, and nothing should be allowed under the auspices of the society which can be regarded as having an immoral tendency.

I am glad to be able to mention the fact that since the abolition of speed premiums the three fairs of the society have been among the most successful and satisfactory ones ever held. Those who entertained the idea that trials of speed were necessary for the success of our fairs, and that it was those trials that called forth the large attendance, and enabled the society to receive an income whereby it could pay its premiums, were mistaken, as the last three fairs have demonstrated. The farmers of this State will support the society so long as it continues true to the object of its organization; and certainly if it cannot be supported upon that basis, the general good would be promoted by its ceasing to exist. But we have occasion for congratulation upon the experiences of the last three years. The society never was so strong financially and never so strong in the affections of the people as at the present time.

I congratulate you, gentlemen, and the farmers throughout the State, upon the bountiful crops of the past year. As a wheat-growing State Michigan has taken rank with the best. I was informed by one of the heaviest produce merchants of the Union during the past year, that while a few years ago Minnesota hard wheat was considered the best produced, yet now Michigan white wheat, in the markets of New York and Liverpool, takes precedence over all others. This is a very important consideration for us, in view of the fact that about one-third of the entire wheat product of the United States is sold for export.

The reports of the Secretary, Treasurer and of the Business Committee will give you the exact financial history of the past year. The society had on hand the first of April of last year, about $8,000. Since that date the treasurer has received some-

thing over $48,000, and the expenses of the society in the construction of buildings at Detroit, the payment of premiums and the expenses have been such, that the amount on hand now is probably from $18,000 to $20,000. For exact figures I refer to the reports.

That we may more readily compare one year with another I recommend that you fix by rule the fiscal year to begin with the first of January. This will enable the reports of all the officers and committees to come to a particular date; and as our winter meeting is now fixed by by-law for the second Monday in January, it will give time to have the reports completed after the first of the month.

I desire to call your attention to a provision in the organic law which limits the society to holding property to the amount of $20,000. Thirty years ago that limit perhaps was not unreasonable, but our experience during the past year shows that it is totally insufficient now. I recommend that you apply to the Legislature at its present session to amend this act so as to increase the amount to the sum of $100,000. Should it be thought desirable to have any further legislation for the benefit of the society to enable it to increase its usefulness, or to throw any further guards about the custody of its property, application for the same could be made at the same time. There is no doubt the Legislature will cheerfully pass any act requested to further the objects of the society.

A question has been raised concerning the liability of the society for loss of property placed upon exhibition at its fairs, whether such loss occur by fire or by theft. A rule has been made by you in that regard, but some have questioned its authority, and perhaps it might be wise to have the question settled by the Legislature. If it should be held that the society was liable, provisions should be made whereby protection can be secured through insurance.

The proceedings of the society have been published for some years past in connection with the report of the State Board of Agriculture. It has been suggested that it would be better to have these proceedings published in separate volumes, the same as the reports of the Pomological Society. As long as room can be spared in that volume for our proceedings without swelling the work to an unreasonable size, perhaps it would be as well to remain as it is; but, if the board find it necessary to condense our report within too narrow limits, I should think it well to ask for a separate volume.

THE UPPER PENINSULA.

Two-fifths of the area of Michigan is in the Upper Peninsula. Our society is organized for the benefit of the whole State. The means of communicating between the Upper and Lower Peninsula are becoming better every year, and we hope soon to see the two peninsulas connected by rail. For the purpose of calling particular attention to the capabilities of the soil of the Upper Peninsula for agricultural purposes, I recommend that special premiums be proposed for agricultural exhibits from that portion of the State.

LIFE MEMBERSHIP.

Our constitution provides for life membership. By the arrangement made a few years since at the time of the consolidation of the Northern Agricultural and Mechanical Society with the State Agricultural Society, the life members of the former were made life members of the latter, with all their rights and privileges. Those rights and privileges have never been defined by this society. Our rules for voting at elections make no recognition of life membership. I recommend that there be prepared a life membership certificate, and that all who are now life members of the society be requested to surrender their present certificates and receive new ones, and that the secretary make a register, so that we may know who are the life members of this society. Upon the back of this certificate should be printed the rule prescribing the rights and privileges of life members, that all may be fully advised.

HIGHWAYS.

There is no one subject in which the farmer is more interested than in the subject of highways. "Cheap transportation is wealth" with the farmer as well as with the dealer. If it costs 20 cents to move one ton one mile on good wagon roads, it will probably cost double that over poor roads. The increase of trade and traffic and the diminished cost of transportion which we have recently experienced throughout this State, with a few weeks of good sleighing, enable us to appreciate somewhat the advantages of good roads.

Our present laws relating to highways came to us as an inheritance from the past.

The assessed valuation of the State of Michigan, as made by the supervisors for 1876, was approximately $375,000,000. The assessment of highway labor is probably not less than one-half day upon the hundred dollars valuation, nor greater than one day upon the same valuation throughout the State. If it was one-half day only, the total highway tax assessed annually in labor would be $1,875,000 for the State. Probably it is safe to say that it is at least $2,000,000, for many of the towns assess the full day to the hundred dollars of valuation. If we add to this the amount which is voted on the recommendation of the commissioner of highways and expended under his direction—the total of which we have no means of ascertaining—it would swell the total to a much larger amount. The suggestions made by Gov. Croswell in his recent message, that some provision should be made for obtaining statistics in regard to these matters, is a most excellent one, and I hope the Legislature will make provision accordingly. I think it is the common experience throughout the State that this assessment of highway labor does not give us such results as might reasonably be expected from the amount of tax. It is too often the case that working on the highways developes into a social visitation, a period for telling stories, practically a few days' recreation. The object of the law is to give good roads; the effect is quite different. Road-making requires skill in design and in execution, and should be under the supervision of skilled men. I suggest whether the subject is not of sufficient importance to the farmer to justify this society in offering a premium for an essay upon this subject, adapted to the climate, soil, condition, and laws of Michigan, to be made short and practical, and which shall consider whether the laws in that regard can be improved; with a view to its publication and general dissemination. The change of a system so old as our present one cannot be made at once, and should not be made until a better one is presented to take its place.

It has been suggested, and I am told the suggestion has taken practical form in some States, that the highway districts should be made very much larger than at present, and of size sufficient to justify the employment of a skilled road-maker to take charge of and devote his entire time to that business. The amount of taxes that have been paid in Michigan for highway purposes certainly should have given us better results. The fact that the tax continues, with no permanent improvement in our highways, calls loudly for change.

I recommend the appointment of a committee to be in attendance at our fairs as a reception committee, whose special duty it shall be to see that guests of the society and those who visit us from other States or foreign countries are properly cared for.

The regulations of the society relative to the receiving of votes at the election of officers have been construed to authorize the reception of votes by proxy. This is a practice which might lead to great abuses. If our regulations in that respect are doubtful, I recommend that they be so changed as to make it clear that at every election every member voting must in person present the ballot.

During the week of the fair the duties of the treasurer of the society are exceedingly arduous, and greater than should be imposed upon any one man. My connection heretofore with the Business Committee has, I believe, given me opportunities to speak intelligently concerning this subject. I believe that our treasurer has honestly and intelligently performed his duty. Some unfavorable criticism was indulged in concerning him during our last fair, doubtless emanating from those who were not aware of the real facts. But for the purpose of relieving him of a portion of the labor heretofore cast upon him, and also for the purpose of furnishing more effectual checks in the management of the financial business of the society, I recommend that the Finance Committee be instructed and empowered to take charge of the gates, and to appoint gate-keepers, and to attend to the collection and counting of the tickets received at the gates, thus leaving the treasurer free to devote his time to the supervision of the selling of tickets and the care of the funds.

I think it would be well to adopt a form for reports of viewing committees to be printed in blank, to the end of promoting uniformity and completeness, and upon these blanks should be printed the regulations governing the committees. The use of such blanks would probably lessen liability to mistakes and facilitate business in the secretary's office.

During the week of the fair the Executive Superintendents are constantly busy, and as their duties call them in different places, it is sometimes difficult for exhibitors to readily find them. They often have occasion to communicate with each other and with the secretary's office. I recommend that each Executive Superintendent have a station conspicuously designated and one or more messengers assigned to his use, so that when the superintendent is necessarily absent from the station a messenger may be left to answer inquiries as to where he may be found; and may also carry messages from him about the grounds, as may be found necessary. I believe this

will greatly relieve the superintendents, and at the same time accommodate exhibitors and visitors.

The constitution provides that any person may become a member of this society one year by paying $1. It is not competent for the Executive Committee to change the constitution. Heretofore, on some occasions, tickets of admission have been furnished to those buying membership tickets, equal in value to the amount paid for membership, and on other occasions equal to half that value. I recommend that this practice be discontinued, and that hereafter no admission ticket be furnished with a membership ticket. If our annual membership is too high, it can be reduced by an amendment to the constitution; if it is not too high it ought not to be neutralized by the presentation of admission tickets.

Much embarrassment has been heretofore experienced at times in awarding space to exhibitors. Each exhibitor seems anxious to exhibit all his goods together, and very often desires space without considering how others may be incommoded by complying with his request. Where goods of the same class are exhibited in different parts of the hall, it is very troublesome for viewing committees to find them, difficult to make comparison, and there is danger that some articles will be overlooked. I recommend that space be assigned to each particular class, and that articles belonging to that class, competing for premiums, be exhibited within the space assigned. Should it so happen that this space should be filled before providing for all exhibitors in that class, special accommodations can be made elsewhere, still keeping the articles belonging to each class together.

I recommend that the committee adopt a rule touching the creation of obligations against the society. Each member of the Executive Committee should know precisely the extent of his power in this regard, and it is important that the Business Committee should know whether claims have been duly authorized before audit.

The area of the State of Michigan is approximately 36,128,640 acres, of which about three-fifths are in the Lower Peninsula and two-fifths in the Upper. Our last reports on the subject show that we have embraced in farms only about one-third of the State. Still nearly two-thirds of Michigan is to be settled and developed. There are thousands of persons in the older States and in foreign countries seeking homes. This society, through its organization and through its members, may exert a good influence in giving information to these people where they may find homes at reasonable prices, in a good society, with a genial people about them; where their children can have the best educational advantages, and where they can have superior facilities for transportation; and we cannot do the State a greater service than to work to that end.

As stated above, the Agricultural College has something over 160,000 acres of unsold land in the Lower Peninsula. The State also has a large quantity of other lands, approximately 2,500,000 acres, which were granted to it by the United States for various trust purposes, and which are on sale at the State Land Office.

Those portions of the State which are or have been covered with pine timber are capable of profitable agricultural development. The older members of the community can look back to places that, within their memory, were shunned as worthless, which have since, under intelligent cultivation, become valuable farming lands.

The streams of the State furnish water power without limit. With our lumber, timber, iron, copper, coal and other products, we are largely interested in mining and manufactures. The great lakes, too, are unequalled for commercial purposes. Our climate is tempered by these lakes surrounding us. The multitude of our inland lakes and streams are capable of producing an immense amount of fish food at a comparatively nominal cost, and these, thanks to our fish commissioners, are being rapidly utilized.

The experience of the past proves that the money value of an acre devoted to agriculture in Michigan is greater than in any other State west or south. The development of the past has been rapid, considering the difficulties under which we have labored. It is within the last eight years that the northern portion of this peninsula has been penetrated by railroads. Before then only the shores were accessible; now every part of the State may be easily reached; and we may reasonably anticipate that the progress of the future will be more rapid than the past. In no State do the interests of agriculture, manufactures and commerce more harmoniously operate for the welfare of the State and the comfort and profit of the people. We have every encouragement to labor hopefully for the promotion of the object for which the society is formed—the promotion of agriculture and its kindred arts throughout the State of Michigan.

On motion of Mr. Baxter the addresses of the retiring and incoming Pres-

idents were referred to a committee of three, for reference of the different suggestions to appropriate departments.

The President appointed as such committee Messrs. Baxter, Beckwith and Smith.

On motion the order of business was suspended and the Report of the Secretary was read, as follows:

REPORT OF THE SECRETARY.

Compared with 1876-7 the year 1878 has been to the Michigan farmer one of continued low prices, increased production, and not marked but substantial prosperity. Crops of all kinds have yielded bountifully and been secured in good condition, and while his hopes of an advance in the market have not been realized, the increased purchasing power of money has generally operated to his advantage. The season has demonstrated more clearly than ever that the leading staple, the one great money-crop of Michigan upon which it must depend to keep the balance of trade in its favor, and upon which the farmer must mainly depend to make farming pay, is wheat. Its value exceeds that of all other farm crops combined. The exact figures cannot be given, but the exportation of wheat probably brings more money into the State than that of all other farm products together. In 1873, the last year for which a census was taken, the cash value of the wheat crop exceeded that of corn, potatoes, wool, fruit, and vegetables combined, by over $1,335,000. According to the supervisors' reports made to the Secretary of State, there were in the ground last May 1,523,841 acres of wheat, which at the same average yield per acre as in 1877, would give 27,596,760 bushels as the crop for 1878. If to this we add the product of the eighty-nine townships which made no report, though many of them are among the best wheat townships in the State, and also make allowance for the ravages of the Hessian fly, which were much more severe in 1877 than in 1878, the Michigan wheat crop the past year undoubtedly exceeded 28,000,000 bushels. This at even the present low prices would give an average of $200 to every wheat producer, or $18 to every wheat eater, man, woman, and child, in the State.

THE GROWTH OF FORTY YEARS.

A subject of such vital interest demands the first attention of every agricultural society and every agriculturist in the State, and to present at a glance the growth and magnitude of the industry, we have prepared from authentic sources a little table showing the acreage, the yield per acre, when possible, and the aggregate bushels grown at intervals for the past forty years:

YEARS.	Acres.	Yield Per Acre.	Bushels.
1839	....	......	2,157,100
1849	492,580	10	4,925,800
1853	473,451	15	7,128,104
1859	....	......	8,313,200
1863	843,881	11½	9,688,672
1869	....	......	16,295,772
1873	1,134,484	12 3-5	15,456,202
1876	1,222,212	13¾	16,885,179
1877	1,312,352	18	23,793,039
1878	1,523,841	18	28,000,000

LEADING THE VAN.

Out of the nine wheat States which outranked Michigan in 1849, she has outstripped all but Ohio, Indiana and Illinois, while Iowa, Minnesota, Wisconsin and California have, within the last few years, shot forward into front rank. Compared with these great States, the Lower Peninsula surpasses them all save Indiana, area for area, in wheat production, and were it possible to compare the proportion of land under cultivation in the two States, there can be no doubt but it would surpass Indiana also.

The State motto might well read: "If you seek the American wheat peninsula, look around you."

The table also reveals the surprising fact that while the aggregate product of wheat in Michigan has doubled about every ten years, the average yield per acre has increased from ten bushels in 1849 to eighteen bushels in 1877. The causes for this most gratifying result are not far to seek. It is due to the greater care of farmers in selecting seed; to the introduction of new varieties, such as the Clawson, which yields better than its predecessors; to improved machinery and methods of drilling and harvesting; and to an increase of live stock and consequent increase of fertilization. The increase in the aggregate is due mainly to the rapid settlement and clearing up of the country, and there is no reason to suppose that the increase will be seriously checked until the millions of acres of wild lands are finally brought under cultivation. What the limit will be, must be left to conjecture.

SURPRISING FACTS.

Mr. Robert L. Hewitt, statistical clerk of the Secretary of State's office, rendered valuable service to the cause of Michigan agriculture by preparing and exhibiting at the State Fair a large map showing the number of acres, the bushels and the average yield per acre of wheat in each county for the year 1877. Among the many important facts which is forcibly illustrated, were some that seemed almost incredible. It is not many years ago since farmers believed that only the extreme southern counties of the State were adapted to wheat culture, yet this wheat map shows that one-half the crop of 1877 was raised north of a line running east and west through the northern edge of Eaton and Ingham counties. Indeed, taking the counties, tier by tier from the Indiana line, neither the greatest aggregate in bushels nor the highest average per acre is reached until we get into the fourth tier, while the fifth and sixth tiers show a higher general average than the first and second, and compare favorably with them in the aggregate bushels produced. The rapid advance of the wheat line into the northern woods is as gratifying as it was unexpected. Along all that sweeping water line—from Monroe at the southeast, with its nineteen bushels to the acre, up to Bay with its twenty-four and Cheboygan with its nineteen, around and down to Berrien, at the southwest, with its fifteen—there is no break in the wheat line, no county where the staple is not grown profitably. Hills and plains, oak openings and cedar thickets, hard-wood and soft-wood land, north and south, the whole peninsula in a wheat belt.

THE CORN CROP.

Second to wheat as a field crop in this State is corn, to be valued not directly by its exports like wheat, but by its home consumption, in feeding stock, etc. The crop increased from 7,500,000 bushels in 1853 to over 20,000,000, in 1873, the average yield per acre increasing from twenty-three to thirty-two bushels in the meantime. The number of acres harvested in 1877 was 732,946, and undoubtedly reached 800,000 in 1878. At thirty-five bushels to the acre and thirty cents a bushel, this would give 28,000,000 bushels as the amount, and $8,400,000 as the market value of Michigan corn crop last harvested. Adding the fodder, and 10,000,000 would probably be a low estimate. A corn map, could one be constructed, would show that this great staple also is admirably adapted to our soil and climate, and is grown successfully in all parts of the Lower Peninsula. The steady increase of the crop at the rate of nearly 1,000,000 bushels annually indicates a corresponding increase in live stock and the fertilizing agencies which would follow an excessive cropping with wheat.

OATS.

The acreage of oats harvested in the State in 1877 was 431,629, being several thousand acres less than in 1876, and the reports for 1878 show a still further decrease in the amount sown. From the best figures and estimates at hand I do not think it is safe to put the oat crop last harvested at more than 14,000,000 bushels. This falling off is due partly, no doubt, to the greater attention given to wheat the past two years in anticipation of a prolonged European war, and partly to a growing belief among farmers that oats are more exhaustive to the soil, more productive of weeds, and, on the whole, less profitable than other crops which might take their place. The cost of producing an acre of oats in the southern part of the State is estimated at $9, so that at 25 cents a bushel anything less than a yield of 36 bushels to the acre is a dead loss. On heavy soils the yield is much more than that, and with the improved varieties and more skillful tillage, it must show greatly increased profits. It forms a cheap and valuable feed for all farm stock, and, I predict, will soon regain its lost ground.

BARLEY.

There were 48,539 acres of barley harvested in Michigan in 1877, and there could not have been far from 50,000 acres last season. At 35 bushels to the acre, and 50 cents a bushel, this would give 1,750,000 bushels as the amount, and $875,000 as the market value of the Michigan barley crop for 1878. The increase in the production of this cereal has not kept pace with that of wheat and corn, and I think one trouble is that farmers depend too much upon the market brewers make for it, and too little upon its value as a stock fattener at home. Mr. David Woodman, of Paw Paw, gives it as his opinion that one bushel of barley is worth about two bushels of oats for feeding purposes. As the cost of production is not materially greater than that of oats, bushel per bushel, the profits of the crop as stock feed must be much greater than is generally supposed.

OTHER CROPS—POTATOES.

As to the yield of the other crops for 1878, the figures are too meagre to warrant an estimate.

The potato crop which had only increased from about 3,000,000 bushels, in 1853, to 5,500,000 in 1873, has probably not yet much exceeded 6,000,000, though the adaptation of late varieties to the light sandy soils and their comparative exemption from the ravages of the Colorado beetle in the northern counties of the State, point to a rapid increase of the crop in the immediate future.

RYE

also in the same region, where it is being grown for pasture and plowed under as a fertilizer. I saw last July on the sandy plains near Higgins Lake, springing from soil where it is said clover could not take root, a luxuriant growth of rye, the stalks standing full five feet high and well headed. It promises to supply the vegetable mould in which the soil is deficient, and if so, the question of reducing that vast belt of pine plains to profitable husbandry is at last solved.

BUCKWHEAT.

Buckwheat, though not a leading staple in the State, forms a very considerable item among the farm products. In 1849 the crop had reached nearly half a million bushels, and in the statistical reports since then, where it is given in the aggregate of oats, rye, barley and buckwheat, it is ranked next to oats in amount, and must now reach four or five million bushels annually. It supplies a nutritious and palatable article for the table, but its value as a food for animals, particularly for horses, sheep and poultry is, I am satisfied, not fully appreciated by our farmers. It thrives on poor soil, where other crops cannot be grown profitably, while on richer soil it grows so luxuriantly as to smother all weeds and leave the soil clear and in good condition for other crops. It matures rapidly, gives quick returns, and as a field crop for orchards and a honey pasture for the apiary it has special advantages.

TIMOTHY AND CLOVER SEED.

The raising of timothy seed and clover seed has also been a profitable branch of husbandry in Michigan, and must increase in extent and profitableness as the land is brought under better tillage and the mechanical appliances for the work are made more effective. The Michigan hay crop of 1873 amounted to 1,134,077 tons, and in localities commanding a ready market it brought most remunerative prices.

Many a good and partly improved farm in the central and northern sections of the State, near the lumber regions, has paid for itself by a single crop of hay. The art of baling and other facilities for transportation have somewhat equalized prices, still hay, whether for sale or home consumption, remains one of the best paying of farm crops.

CLOVER.

As a manurial agent clover surpasses all other crops known or cultivated. It pumps up nitrogen with its roots, absorbs ammonia with its leaves, and stores them in the surface of the soil for the nourishment of other crops. In this way it counteracts the heavy drain made upon the soil by the constant cropping with wheat. Without a judicious and liberal use of such restoratives, the fertile wheat farms of Michigan must in time become as worn-out and sterile as the exhausted tobacco plantations of Virginia.

FIELD PEAS.

Within the last few years a new rival of corn and oats as a field crop has made its appearance in the State, and the next census will undoubtedly surprise many farmers

with the extent of a crop with which they are comparatively unacquainted, and that is field peas. One farmer in Antrim county had 23 acres sown to peas the last season, and the yield was about 30 bushels to the acre. In a somewhat extensive tour through the newer portions of the State I noticed many fields of peas, and the crop seems to be a favorite one, especially with the settlers from Canada. They prefer peas to shelled corn for stock feeding, bushel per bushel, and they claim that the former is the more easily cultivated of the two. If this is a fact, it is certainly a most important one, which Michigan farmers should be the first to profit by. The cultivation of millet, flax, hemp, hops, broom corn, sugar cane, and other articles too numerous to mention must all be taken into account as making up the grand aggregate of Michigan's farm products. To what extent they will in future be cultivated will depend on the tastes of the cultivator or the state of the market, and not on the soil or climate, which are adapted to them all.

FRUITS.

Secretary Garfield, of the State Pomological Society, has prepared so full a report of the fruit exhibited at the Fair and of the fruit interests of the State at large, as to leave little to be said upon that subject. The orchards of Michigan were never more numerous and thrifty or more promising of rich returns in future than they are to-day. The subject of growing apples for the European market is attracting attention and may have an important bearing on the fruit trade in future. Several shipments were made from this State to Liverpool in the fall and others will follow in the spring. Experience shows that only the most hardy varieties can stand the long voyage uninjured, the tender fleshed varieties most popular at home being scarcely marketable when they reach the other shore. The fact must be borne in mind by orchardists, and must determine their selection of trees where they plant with a view to profiting by the foreign trade.

HORSES.

The number of horses in the State increased from 58,506 in 1850 to 281,594 in 1874, and must now considerably exceed 300,000. The improvement in blood and quality has more than kept pace with the increase of numbers, and Michigan now boasts of some of the finest thoroughbreds in the country. The great demand is for serviceable roadsters which combine nimbleness with strength and toughness, and not the qualities which would make the animal first choice on the race course, nor conspicuous as a draught horse. On our level lands and easily tilled soils, size is not so essential in a farm horse in Michigan as among the hills of Pennsylvania, or on the hard clay soils of some other States, and it is a question whether the society has not fixed its standard of weight too high. What is gained in size is more than lost in quickness, and for most farm purposes a medium-sized horse will be found cheapest and most serviceable.

CATTLE.

The number of neat cattle one year old and over in Michigan increased from 119,471 in 1850 to 307,554 in 1874. The present number of neat cattle in the State is probably not far from 350,000. At the present ruling prices for beef this branch of husbandry is not remunerative, as Michigan farmers are finding to their cost. The remedies are to be found in an exchange of the native mongrel stock for improved grade animals; in improved methods of fattening; in killing at an earlier age, and in taking advantage of the rapidly developing foreign market. Short-horns, Ayrshires, Herefords and other thoroughbred bulls are becoming so common, and when crossed upon good native cows, give stock so much larger and better adapted for the market than native animals, that the raising of the latter is an excusable waste of time and feed. But the price realized for the beef's carcass is not the sole profit of stock raising to the farmer. Cattle return to the soil the elements taken from it by the crops, and so maintain or restore its fertility. In connection with the Michigan wheat map referred to above, Prof. Manly Miles, of Lansing, has prepared a live stock map of the State, showing that there is a nearly constant ratio between the number of horses, cattle and sheep in any county, and its yield of wheat. The more cattle the more wheat, or, as Prof. Miles expresses it: "The lesson of the diagram is, that to grow wheat successfully, you must keep stock."

The number of milch cows in the State in 1874 was 321,832, and the product of butter is given at 27,972,117 pounds, and of cheese at 4,104,942 pounds. The dairy interest is thus seen to be a large one, but is still far out of proportion to the grain raising and stock raising capabilities of the State. It has, moreover, grown up as a weed, by sufferance, rather than a useful plant which needs constant and intelligent

cultivation. The cows were raised and fed without special reference to their milk producing qualities; the butter is of all kinds, and made by the most primitive processes; cheese factories are not half so numerous or well patronized as they should be. Good wholesome cheese should be as common as bread, but on many tables it is never found. and on many others only as a rarity. The English consumption of cheese 16 pound per capita annually. If Michigan ate every pound it makes, the average consumption would be but two and a half pounds. With its rich pasturage and pure water, there is no good reason why Michigan should not make as sweet butter as any other State, yet, as a matter of fact, Detroit dealers order their finest grades from New York. Reform is necessary if Michigan dairy products are to hold the market abroad. Durham cows are noted for the quantity and quality of their milk, and those having an admixture of this and other equally good blood, should alone be selected for the dairy, and should have their natural capabilities for milk increased by judicious care and feed. To feed for the shambles and to feed for milk are two very different processes, though the distinction is quite commonly overlooked. With the present outlook for the Michigan stock breeder, his interest seems to lie in the cultivation of the milk giving as well as in the beef producing qualities of his stock.

SHEEP.

In 1874 there were in the State 1,651,903 sheep, being 401,453 less than in 1864. For this reduction or about one-fifth in 10 years a number of causes combined, all, however, of a temporary and local character, and such as could not permanently affect the growth of the sheep interest. Within the space of a year or two at the close of the war, injudicious legislation drove the price of wool from 30 and 40 cents a pound up to $1 a pound and upward, and thousands of adventurers embarked in wool growing as a speculation, without any special experience or knowledge of the business. Like those who embarked in wholesale hop raising about the same time, the ill-advised wool growers were soon glad to sell out at heavy sacrifices, and under an equitable tariff, the wool trade settled into its natural channels again. In despite of unwise legislation the wool product of the United States has increased from about 54,000,000 in 1860 to about 275,000,000 in 1878, and Michigan has contributed its share to this increase. The clip of 1873 amounted to 7,729,011 pounds, and showed this gratifying fact, that the average yield of wool per head had increased from 2½ pounds in 1850, to 4 3-5 pounds in 1872. This tells us plain as figures can, that the original bare-legged, scraggy flocks have been rapidly giving place to the short-legged, round-bodied, thick-coated breeds in which alone the wool grower must find his profits. Whether these profits shall be largest from the long, short or middle wools, must depend largely upon the location and character of the farm, but in places convenient to market, undoubtedly very good returns are to be expected from the breeding for mutton as well as for wool.

Next to wheat, wool is probably the second great money crop of Michigan, while breeders find no small share of their profits in supplying the West with thoroughbred American Merinos, Cotswolds, Leicesters, Lincolns and others for breeding purposes. The State Association will ask you for $500 to be expended in premiums at a proposed sheep shearing festival to be held at Jackson next April. Much good may be derived from such a meeting, and the request is worthy of careful consideration.

ROOTS AND VEGETABLES.

As to the crop of roots and vegetables no statistics can be given, but the amount is enormous. The society offered 72 separate premiums in this class, yet at least three exhibitors made about 150 entries each, and many more would doubtless have been made had adequate accommodations been furnished them. For variety and general excellence of its roots and vegetables Michigan will compare favorably with any State in the Union. Her light sandy soil, impregnated with lime, is peculiarly adapted to root crops and in favorable seasons they reach dimensions which seem incredible. At the Grand Traverse county fairs have been exhibited, I am assured, a squash, grown in the vicinity, weighing 142 pounds, a flat English turnip 19½ pounds, a rutabaga 24 pounds, a beet over three feet long, and white Belgian carrots 16 inches in circumference; and these figures have no doubt been equalled or possibly surpassed at other county fairs, though I have no authentic record of them. Last year Mr. John Jolliffe, of Antrim county, raised 350 bushels of carrots from half an acre, and 1,200 bushels of rutabagas from less than three acres, sown broadcast; and Mr. Almond Young, of Round Lake, reports raising rutabagas at the rate of 1,000 bushels to the acre. These are not extraordinary yields, and their significance can hardly be over estimated. In a soil where such growths are common, or even possible, the growing of root crops for stock feeding and other purposes must soon become a feature of

Michigan agriculture, increasing in importance as husbandry becomes more diversified.

IMPROVEMENT IN FARM IMPLEMENTS.

The increase in farm products has been attended and in part caused by a remarkable improvement in farm implements. In every department of farm work, and at every stage from the breaking up of the soil to the marketing of the grain, invention has lent a helping hand, and a large proportion of labor, but recently done by hand, is now done better, cheaper and more rapidly by machinery. Plows, harrows, rollers, planters, seed-drills, cultivators, reapers, mowers, rakes, threshers, shellers, straw-cutters, etc., have multiplied beyond all precedent, and year by year are being brought nearer perfection. Six years ago there was scarcely a farm windmill in the State. Now they are quite common and in many localities are the main dependence for watering stock. A few years ago, when the Flint and Pere Marquette railroad pushed west from Saginaw, there was scarcely a flouring mill in Central or Northern Michigan. To-day there are a score of large flouring mills on the line of that road and north of it, and all are doing a large custom work. A great desideratum is a cheap and effective stump-puller, unless the new method of blasting them out should meet those requirements.

COMPARISON WITH OTHER STATES.

From such imperfect data as are at hand, I have reviewed thus briefly the amount and relative importance of the different farm products of the State. I close this branch of the subject with a comparison of Michigan with other western States. The following table, compiled from the Government Agricultural Reports, shows the average cash value per acre of the products named for five consecutive years, ending with 1875:

	Michigan.	Wisconsin.	Minnesota.	Illinois.	Kansas.
Corn	$17 37	$14 74	$14 01	$10 05	$10 91
Wheat	16 66	13 31	12 86	12 74	14 95
Rye	10 99	10 11	10 39	9 80	9 87
Oats	12 49	12 23	11 36	8 34	9 04
Barley	19 21	22 06	16 95	16 83	14 93
Buckwheat	11 97	10 37	13 25	10 89	15 09
Potatoes	49 52	46 06	41 37	43 55	51 17
Hay	16 32	12 95	7 81	12 56	5 68
Total for one acre	$154 53	$141 83	$128 06	$124 76	$140 92

The table shows, in nearly every instance, a difference in favor of the Michigan farmer, due partly to difference in soil and tillage and partly to his nearness to the eastern market.

SWINE.

In 1874 the number of hogs over six months old in Michigan was 401,719, and the product of pork the year previous was 48,434,106 pounds. No well regulated farm is complete without a few swine, and in the southern counties of the State especially the pork crop is looked upon as second only to the wheat crop in value. The hog has always been the farmer's scavenger, converting into meat what would otherwise go to waste or become a nuisance, the scavenger being a source of more annoyance and receiving less care than any other tenant of the farmer. Of late years he has received more attention, and there is a growing disposition to accord him the same considerate treatment shown the sheep and ox. The old wind splitters have been worked over into grade Berkshires, Suffolks, Essex and Poland Chinas, and are now stall fed instead of foraging at random as formerly. The margin of profit is not large and can only be increased by improving the breed, fattening more systematically and with more concentrated food, and killing at an earlier age. Pork raising should accompany grain raising as a profitable auxiliary, and we look forward to the census of 1880 to show an unprecedented advance in this branch of Michigan husbandry.

POULTRY.

Poultry does not usually find a place in the farmer's live stock account, though it frequently forms a very considerable item of his income. There is always a demand for good poultry and fresh eggs at fair prices, and on a well conducted farm a number of fowls may always be kept at an inconsiderable expense. In this as in all other classes of domestic animals the profits is the best breeds and especially in those breeds which combine in the highest degree the best qualities for the table and for the production of eggs.

BEE CULTURE.

Hereafter no inventory of Michigan's farm products will be complete which does not include the apiary. The State Bee Keeper's Association, a flourishing organization, numbers over 100 members, mostly specialists and amateurs, some of them keeping several hundreds of colonies. Mr. Roup, of Carson City, reports his sales of honey for the past season as aggregating $2,300, while Mr. Heddon, of Dowagiac, sold 8,000 pounds at prices ranging from 9 cents a pound for extracted honey, to 18 cents for comb, and many others have no doubt done as well. The aggregate product of the State cannot be safely estimated, but it is evidently large, as are also the profits, where the bees are properly managed. The introduction of artificial comb foundation. and the improved methods of breeding, feeding and hiving bees are working quite a revolution in the apiary, and aiding materially to its profits. Southern Michigan, with its cultivated field of clover, buckwheat and succession of summer bloom, and Northern Michigan, with its native basswood groves, raspberry thickets, and wild flowers, are all admirably adapted for bee pasturage, and insure a rapid development of this industry, the profits of which should be shared, not by specialists merely, but by farmers generally.

J. P. THOMPSON.

On motion the report of the Secretary was referred to the appropriate committees when appointed.

Treasurer Dean asked permission to make a personal explanation, which was granted.

Treasurer Dean took the floor and read from the Detroit Evening News the following article, in which it is charged that there was a ring in the State Agricultural Society, and which accused Mr. Dean personally of corrupt practices, as treasurer of the State Agricultural Society.

[From the Evening News, September 21.]

A paragraph in the News of Wednesday to the effect that great discrepancies were alleged to exist between the gate receipts at the State Fair, and the number of visitors to the ground, has created considerable excitement, especially as no denial has been made by the treasurer, Mr. Dean. The News reporter obtained his information from a responsible official of the Society, who further stated that the Free Press people had stationed private detectives at each gate to spot the number of persons admitted. The treasurer has not yet made up his account of receipts, as tickets of different values were issued, which have to be canvassed. The counting of the dime tickets issued to school children, and of quarter dollar "special rates" and complimentary tickets will occupy all the afternoon. The amount of receipts will foot up $35,000. Mr. J. P. Thompson, the outgoing Secretary, says that very much more than $35,000 ought to have been taken. He estimates that in the five days at least 120,000 people visited the Fair, ninety-nine per cent. of whom at least should have paid full rates. At the smallest calculation, $50,000 should have been gathered in. At Grand Rapids, five years ago, where the fair was not half as large as this week, the receipts were $28,000. "Think of that," said Mr. Thompson. "I tell you that the State Fair ring is a rotten one of the very worst kind, and it was because I wouldn't knuckle down to them that they ran me out of the secretaryship. They say in the papers that they do not know what to do with their surplus. It will go where it will do the ring the most good. When my accounts are audited I will make such an exposure of the inside workings of the men who engineer the State Fair as will astound the people of Michigan."

On motion of Mr. Beckwith, it was

Resolved, That if Mr. Thompson has any charge of corrupt practices to make

against Treasurer Dean, or any other member of the Executive Committee, that he present the same in writing.

Adopted.

On motion, a special committee of three was appointed to investigate the charges made by Mr. Thompson in the Evening News.

There was named by the President as such committee, Messrs. Parsons, Fralick and Smith.

H. O. Hanford asked for permission to make a personal explanation, which was granted. Mr. Hanford read from the Michigan Farmer a communication of Mr. Coller of Flint, accusing him of having changed the premium on a seed drill, after it had been awarded by the Viewing Committee.

On motion a committee of three was appointed to investigate the charges made by Mr. Coller.

The President appointed as committee Messrs. Rising, Burrington and Kipp.

On motion, the order of business was suspended, and the Committee on Premium List was appointed.

The President appointed as Committee on Premium List Messrs. Humphrey, Phillips, Hyde, Ball and Rising.

Mr. Sterling submitted the report of the Business Committee, which accompanies this report, and is marked "STATEMENT A."

On motion, the Report of the Business Committee was referred to the Finance Committee.

On motion, the Committee then adjourned until nine o'clock Tuesday morning.

Approved. W. L. WEBBER,
President.

SECOND DAY.

Tuesday Morning, January 14, 1879.

The committee met at nine o'clock, President Webber in the chair.

The roll was called by the Secretary, when the following members answered to their names:

President Webber, Secretary Johnstone, Treasurer Dean, Messrs. Phillips, Rising, Sterling, Fralick, Hyde, Angel, Howard, Hanford, Manning, Wood, Smith, Burrington, Dewey, and Ex-Presidents Shoemaker, Beckwith, Baxter and Humphrey.

The President notified the Committee that they had the privilege of appointing a scholar to the American Veterinary College, New York.

The minutes of the last meeting were read and approved.

Mr. Baxter, from the Special Committee, read the report in reference to the assignment of the suggestions in the addresses of President Humphrey and President Webber. Adopted.

Mr. Phillips, Superintendent of Cattle, Division A, at the exhibition of 1878, submitted his report, accompanyiag it with the following recommendations:

First. The time entries of cattle should be made. When I arrived on the ground, the 13th, we had 304 stalls for cattle. Some time during the 14th Mr. Rising went to the Secretary's book and reported 260 entries. I supposed the rule on page eighteen of the premium list closing the time for entries on Thursday the 12th, would be strictly enforced; but for some good reason, no doubt, it was not carried out. This

made it necessary for Mr. Sterling to prepare 223 new stalls before the stock could be made comfortable. All this trouble was borne by the exhibitors with the best of feeling, always saying, "do the best you can." I now recommend the positive closing of the books for entries ten days previous to the Fair in Division A.

The second point is this: I believe the time has come when we should protect our own breeders so far as cattle are concerned; because we now have a very numerous class of small breeders that have started within the last few years very choice herds, and all in breeding condition; and here I want to remark, it is almost always the case that the small breeders bring their cows to the fair giving milk, and their calves with them, as they should do, while the large breeders seldom do. In place of this fat and barrenness is the condition of many of their animals, and we never hear of them again after the ribbons are tied on.

I would limit the regular breeding class to Michigan, because it is too great a loss to risk the spoiling of a good herd of cattle by pampering them to compete with professional showmen, as is always the case when they come from abroad.

Allow me to call your attention to the wild way of judging cattle at our fairs, which seems to be all guess work. This seems to demand a change. I would recommend the following scale of points adopted by the New York State Agricultural Society. Alo, a book prepared by Mr. I. H. Butterfield, Jr., as a sample to be used by the judges while scaling the cattle at the ring, with instructions for using.

Referred to committee on Rules, and committee on Premium List.

Members were invited to discuss the subject of exhibition of cattle.

Mr. W. G. Dean, of Hanover, discussed Jersey cattle.

F. V. Smith, Superintendent of Horses, Division B, submitted his report and made the following remarks:

If the same grounds are used again important changes and additions will be necessary to have it prudent or safe to make such an exhibition of the animals as will enable the Viewing Committees to form a correct judgment. The Judge's stand and the track in front will require such an enclosure as will keep all outside but the judges and the animals to be judged, and the whole track will require such enclosure as will keep out all animals but those under examination.

Referred to Committee on Rules and Business Committee.

A. F. Wood, Superintendent of Sheep, Division C, submitted his report and remarked:

There can be no question but the interest in the mutton classes is growing, and the demand for sheep suitable for London market is increasing. I see no reason why these classes should not receive as much money and the same prizes as classes nineteen and twenty.

I would suggest also a class of grade ewes of either long or middle wool, to correspond with fine wool grades. Class 24, Fat Sheep, the show was good. The whole number of sheep shown was 475, against 482 in 1877.

I would further report that the State Sheep Breeder's Association, held at Marshall in December past, recommended a Sweepstakes prize in fine wools, for a Ram with five of his get, also they claimed that there is not as much money paid for the interest in this department as the other interests, in proportion to the real value, and with a similar premium list of last year they asked to have the premiums increased to twelve hundred dollars, the amount being offered last year was eight hundred and thirty-four.

AMOS F. WOOD,
Superintendent.

Referred to the Committe on Premium List.

D. A. Blodgett, Superintendent of Division D, Swine, not present.

T. D. Dewey, Superintendent of Division E, Poultry, submitted his report. Filed with Secretary.

F. M. Manning, Superintendent of Division F, Agricultural Products, submitted his report.

Referred to Business Committee and Committee on Premium List.

The President announced the following Committees:

To take action on the death of Col. Chas. Dickey, ex-President of the Society, Messrs. Shoemaker, Beckwith, and Baxter.

On that part of President Humphrey's address, referring to the services of the Chairman of the Business Commitee, Messrs. Parsons, Dewey and Howard.

Mr. Rising, Superintendent of Forage, submitted his report and made certain recommendations, as follows:

I would suggest that the entries of stock should close ten days before the fair, so that the superintendents could tell the amount of forage needed before the fair. I would also suggest that the secretary should give the exhibitors a certificate of the number of entries each one has, so that the superintendents may know the amount each one may want.

The treasurer, Mr. Dean, presented his annual report, which showed the following summary:

RECEIPTS.

Cash on hand	$9,639 62
Citizens' subscription, Detroit	10,000 00
Membership certificates	1,157 00
Gate receipts	33,761 15
Booth rents	3,355 50
Peddlers' licenses	148 50
Kindling wood, etc	22 94
Rebate	7 00
Sales matresses	4 50
Collection on grand stand	3 00
Cash at check room	39 30
Rebate on lumber	87 76
Returned by President	500 00
Saginaw Driving Park	53 84
Total	$58,780 11

DISBURSEMENTS.

Tickets returned from Thompson, Secretary	$30 00
Expense of Canada collections	1 50
Tickets returned from Russell House	150 00
Grand Trunk Railway coupons rejected	16 50
Old premium checks, previous year	182 00
Business orders, 1878	28,197 70
Premium checks, 1878	10,357 25
Pomological checks, 1878	816 25
Total	$39,752 20
Balance in the treasury at date	19,027 91
	$58,780 11

Mr. Dean stated that this sum is deposited as follows: $5,000 each in the Wayne County, Detroit and Lenawee County Savings Banks, and the balance Commercial Exchange Bank, of Adrian.

Mr. Dean also made a statement with reference to the published allegation that the gate receipts of the great day of the fair obviously dd not correspond-with the number of people in attendance. He gave the figures, showing the number admitted free as exhibitors, or in charge of exhibits, the employés of the numerous refreshment booths, the complimentary tickets, all railroad employés, members of the police and fire departments of Detroit and their families; school children and others admitted on reduced fare tickets, etc. All these numbered in the thousands. As showing how wild estimates are liable to be quoted from the Toledo newspapers during their fair in which it was claimed that there were 80,000 to 90,000 people in attendance; also, from the official report of the managers of the fair, showing that the sale of tickets

showed that there were only 28,000 visitors. He then stated in detail the system of taking up tickets at the gates and the manner in which they had been preserved. The tickets are now in the hands of the business committee, to be examined and counted.

Referred to Finance Committee.

Mr. Baxter announced that Mrs. Stewart and Mrs. B. B. Hudson were in attendance to submit a communication to the Committee.

The ladies were introduced by Mr. Baxter and submitted the following:

WHEREAS, Rule 9th, Article 6th of the published Rules of the Michigan State Agricultural Society, was openly violated on the Fair Grounds during the State Fair of 1878, we, a committee appointed for this purpose by the Executive Committee to the Woman's State Christian Union ot Michigan, do in the name of the women of Michigan, most earnestly appeal to the Executive Committee of the Michigan State Agricultural Society to order its Business Committee, in carrying out the "instructions of the Executive Committee in regard to preparing for and holding Fairs." (Rule 11th, page 15), strictly to regard in its spirit as well as letter, Rule 9th, Article 6th of the rules of the "Michigan State Agricultural Society."

MRS. I. G. D. STEWART,
MRS. F. B. CRESSEY,
MRS. B. B. HUDSON,
Committee of Woman's State Christian Union, Mich.

Mr. Baxter offered the following resolution, which was unanimously adopted:

Resolved, That for the future the rules of this Society in reference to the sales of intoxicating liquors be rigidly enforced, both in letter and spirit, by the President. the Business Committee and all the executive officers of the Society, so long as these rules remain the rules of the Society.

Mr. Wood moved that a certain premium on middle wool sheep, wrongfully credited to J. A. Moore, be properly assigned to T. A. Moore.

Adopted.

On motion of Mr. Burrington, a committee of three was appointed to confer with the committee in attendance from the State Pomological Society.

The President named as such committee, Messrs. Burrington, Cobb and Hanford.

Report of Superintendent of Agricultural Implements.—Deferred.

J. Q. A. Burrington, Superintendent of Division H, Vehicles, submitted his report and the following recommendations:

I would recommend that a building be erected for this department of more attractive appearance, enclosed on all sides, that the finer work may be protected from sun and storm, and that it be well lighted from the roof. I would also recommend that the list of premiums be extended so as to embrace all kinds of vehicles in common use.

Wm. M. Ferry, Superintendent of Division I, Machinery. Not present.

Henry Fralick, Superintendent of Division J, Manufactures, submitted his report, with the following remarks:

I cannot do better than to repeat mainly my recommendations of last year. That from the knowledge and experience obtained in charge of the department of Manufactured Goods at the two last annual fairs, and from my general observation on this subject, I would respectfully recommend that the classes in this department be carefully examined and revised by the Committee on Premiums, and that the cash premiums on a large number of materials and manufactured articles of general utility should be considerably increased. I am confident that many manufacturers and producers would much prefer to have a money premium to help pay expenses of transportation and exhibition of their articles than any other acknowledgment of merit. There are every year a large number of articles exhibited at our fairs that are of very little value or utility, and if premiums are not offered and awarded for such articles,

they will soon cease from occupying valuable space that is very much needed by articles of merit.

The great aim and object of this society, in this department especially, is or should be to, in every legitimate way in its power, increase the production and exhibition of such materials and manufactures as are and will prove to be most beneficial to the true and best interests of the State and its citizens.

The President directed the attention of the Committee to the desirability of having the proceedings printed daily.

On motion of J. M. Sterling, the following resolution was adopted:

Resolved, That the proceedings be printed and furnished each morning, for the use of the Executive Committee.

G. S. Wormer made a verbal report as Superintendent of Division K.

On motion of Mr. Baxter, further time was granted Mr. Wormer to make a written report.

W. J. Baxter, Superintendent of Division L, Art Department, submitted his report. Referred to Business Committee and Committee on Premium List.

J. W. Childs, Superintendent of Division M, Miscellaneous. Not present.

W. J. Baxter submitted a report from Mrs. A. J. Brow, Mrs. Dean, and Mrs. Garrison, Superintendents of Division N, Children's Department, and recommended that this department be continued, without any specification of premiums, and that an appropriate sum be assigned for premiums.

Referred to Committee on Premium List.

H. O. Hanford, Superintendent Division G, farm implements, submitted his report. His recommendations are:

I would recommend that shafting should be furnished so that they could be more readily shown. We beg respectfully to call your and the Committee on Rules attention to the attendants tickets; whether some method may not be introduced by which exhibitors may be admitted to the grounds without taking up nearly the whole time of one of the superintendents in our department.

Referred to the Committee on Rules and Premium List.

Mr. Baxter offered the following resolution:

Resolved, That the Executive Committee of the State Agricultural Society, through the President and Secretary, present a memorial to the Legislature, asking for such change in the laws of the State relating to highway labor as will secure the payment of highway taxes in money and the expenditure of the same under such superintendence and control will secure more profitable and valuable results.

Laid on the table for further discussion.

On motion of Mr. Wood the committee adjourned until 2:30 P. M.

AFTERNOON SESSION.

The committee re-assembled pursuant to adjournment, the roll being called, a quorum was not present.

On motion, the committee adjourned until 7 o'clock P. M. to give the special committees time to consider the subjects referred to them.

EVENING SESSION.

The committee met pursuant to adjournment, the President in the chair.

Present, Messrs, Angel, Burrington, Childs, Dewey, Hanford, Howard. Manning, Smith, Wood, Ball, Cobb, Fralick, Hyde, Kipp, Phillips, Rising, Sterling, M. Shoemaker, W. G. Beckwith, W. J. Baxter, E. O. Humphrey, the treasurer, Secretary and the President.

The President announced the following committees:

Committee on Organic Law on Amendments to Constitution, Messrs. Baxter, Beckwith and Angel.

Committee on County and other agricultural societies, Messrs. Sterling, Shoemaker and Kipp.

Committee on Agricultural College and its Relations to this Society Messrs. Cobb, Smith and Phillips.

Mr. Shoemaker, from the committee to which was referred that part of President Humphrey's address, referring to the death of Colonel Dickey of Marshall, submitted the following, which was adopted:

The committee to whom was referred that part of President Humphrey's address announcing the death of Colonel Charles Dickey, would respectfully make the following report:

The Executive Committee of the Michigan State Agricultural Society have heard with deep regret of the death of Colonel Charles Dickey, an ex-president of the Society, which occurred on the 12th inst. at his residence at Marshall.

The record of the life of Colonel Dickey is one of which his family, the community in which he lived, and the people of the State of Michigan may well be proud.

One of the pioneers of the State, he has always occupied a prominent place in its history,

He has filled many offices of honor and trust, in his county, in the State, and under the general government, always with credit to himself, and to the entire satisfaction of his constituents.

At an early day a member of the Senate of the State of Michigan, he discharged the duties of his place in a manner calculated to promote the best interests of the State.

As president of this society in 1858 and 1859, and as one of the executive committee, of which he has since been a member, he identified himself with the agricultural interests of the State, and his counsel was of great value, as it was always dictated by a desire to do the greatest good, and governed by a comprehensive knowledge of the relations existing between the society and the people, as well as of the measures best adapted to promote the interests of both.

Colonel Dickey was always a leading citizen of his own county, and often chosen by its people to fill offices of a local nature. He enjoyed, as he deserved, the fullest confidence of the entire community. Genial in his manners, amiable in his disposition, unbounded in his hospitality, he was as universal a favorite in society, as he was beloved in the family circle.

Called from among us full of years and of honors, we feel that we but express the general sense of his merits when we say of him that he was "an honest man, one of the noblest works of God."

Resolved, That this Society, in giving expression to their sense of the high character of Colonel Charles Dickey, and of the great loss caused by his death, feel that the good he has done will live after him, and that his example in all the walks of life will be of great value to the community in which he lived, as well as his best epitaph.

Resolved, That a copy of the above report and resolution, be engrossed by the Secretary and forwarded to the family of Colonel Dickey.

Detroit, Mich., January 14th, 1879.

M. SHOEMAKER,
W. G. BECKWITH,
W. J. BAXTER,
Committee.

Mr. Burrington, from the committee to confer with the Committee of State Pomological Society, submitted the following report, which was accepted and adopted:

The committee appointed to confer with a like committee from the State Pomological Society upon matters of common interest to both organizations, especially in connection with the annual Fair, respectfully report as the results of joint interview:

First, That the Pomological Society be invited to exhibit with us at the annual Fair, under the same regulations as to entries, admissions, payment of premiums, etc., as last year.

Second, That there be appropriated for the use of the Pomological Department of the fair the same amounts as last year, to wit: $1,000 for premiums and fourteen hundred dollars for general expenses, under like regulations and restrictions as in previous years.

Third, That in case it is found necessary or advisable to erect a new hall for any purposes, if consistent with the best interests of the fair of 1879, this hall be built for the pomological exhibit and the present hall be employed for other purposes, and further, in case such arrangement should be made the State Pomological Society be invited to draft plans for such hall, to be placed in the hands of the Business Committee for their consultation and possible adoption. Provided always that the internal arrangements of such hall in its erection be placed under the direction of the Pomological Society. In case it is considered best to employ the same hall as in 1878, we recommend that the necessary amount appropriated for fitting the hall for the fair of 1879 be placed under the direction of the Superintendent of the Pomological Department.

Fourth, We recommend that the Business Committee, in making arrangements for the transportation of material to and from the State Fair, take into consideration the perishable nature of the products exhibited in the Pomological departments, aad, if practicable, secure the usual reduction without the return of these products to the place of shipment.

We recognize the valuable work accomplishing through the efforts of the State Pomological Society, and while writing the above recommendation, feel that we express the sentiment of the State Agricultural Society when we say that we cordially extend our sympathy in the prosecution of the work of developing the horticultural possibilities of Michigan.

J. Q. A. BURRINGTON,
W. H. COBB,
H. O. HANFORD, *Committee.*

Report accepted and adopted.

Mr. Parsons, from the committee on that part of President Humphrey's address referring to the services of the Chairman of the Business Committee, reported as follows:

Your Committee, to whom was referred the question involving the wisdom and propriety of some action on the part of the Executive Committee in reference to the services of Mr. J. M. Sterling, Chairman of the Business Committee of the State Agricultural Society, have given the matter consideration, and would unanimously recommend the adoption of the following preamble and resolutions:

WHEREAS, Mr. J. M. Sterling has for a number of years given his time freely and without compensation for the preparation of grounds and buildings for the annual State Fair;

WHEREAS, Mr. Sterling did at great personal cost of time and money give his services, to the best of his judgment and ability, for nearly four months to the preparation of suitable facilities for the great fair and exhibition so successfully held in Detroit, in such a manner as to give universal satisfaction; therefore,

Resolved, That this Executive Committee, recognizing the wisdom of his management and the singular devotion and fidelity displayed by him to the best good of the Society and the great interests it represents, tender him the expression of our mose hearty appreciation and sincere thanks;

Resolved, further, That desiring to present to him some permanent testimonial that may be cherished by his descendants of the high estimate we place on the value of the service rendered by him to the Society, as well as an evidence of personal respect for our associate, that the treasurer be and he is hereby directed to prepare a gold medal with some suitable inscription engraved upon it, and that the President present the same to Mr. Sterling on behalf of the Society.

Respectfully submitted,

P. PARSONS.
T. D. DEWEY.
D. W. HOWARD.

The President read a letter from Mr. Waters, of Dayton, Ohio, requesting that a diploma be issued to him in lieu of a money premium.

On motion of Mr. Sterling the request was granted.

Mr. Dean presented the claim of parties exhibiting the McKenzie Tile Machine, for a certain premium.

On motion, the claim and committee books of Division 1, Class 42, were referred to the Superintendent, Mr. Ferry, for a report thereon.

J. E. Strong sent in a communication requesting an exchange of premium. Laid on the table.

Moved by Mr. Sterling, that it is the sense of this Committee that in the rules it shall be provided that the names of exhibitors be placed on the entry cards. Adopted.

Mr. Sterling, from Business Committee, submitted several accounts, and asked for instructions as to their disposal.

The account of C. H. Jennings for use of grounds. Laid on the table.

Account of J. M. Field. Referred to special committee consisting of Messrs. Parsons, Hanford and Kipp.

Account of J. B. Hinchman. Referred to same committee.

Account of J. P. Thompson for balance salary up to January 13, 1879. Referred to same committee.

Account of J. P. Thompson for sundries, amounting to $7.00. Allowed.

Account of Mrs. J. P. Thompson for rent of office. Laid on the table.

Account of *Homestead*, not allowed by a vote of 13 nays to 4 ayes.

Accounts of Patrick McLevie, F. J. Herbison and S. Dunseeth, of Canada.

Mr. Baxter moved that the above bills be returned to the claimants, with the information that this Society has never allowed for freight on roads outside of the State.

Adopted.

Mr. Cobb reported from the committee on the communication from the Agricultural College, in reference to the appointment to free scholarship at the American Veterinary College of New York.

Mr. Cobb offered the following resolution, which was adopted:

Resolved, That this Society do hereby recommend Henry F. Buskirk, of the State Agricultural College, for the scholarship at the American Veterinary College.

Mr. Baxter offered the following resolution, which was adopted:

Resolved, That for the future, when clerical assistance is required by the Secretary, no clerks shall be employed by him for the benefit of the Society, without consultation with and the consent of the President of the Society, both as to employment and compensation, and all bills for services of such clerks shall be certified by the President and Secretary before being allowed.

On motion, the committee then adjourned to meet at 9 o'clock Wednesday morning.

THIRD DAY.

Wednesday Morning, January 15, 1879.

The committee met at 9 o'clock, President Webber in the chair.

Present, Messrs. Angel, Burrington, Childs, Dewey, Hanford, Howard, Manning, Smith, Wood, Ball, Cobb, Fralick, Hyde, Kipp, Phillips, Rising,

Sterling, M. Shoemaker, W. G. Beckwith, W. J. Baxter, E. O. Humphrey, the Treasurer, Secretary and the President.

On motion, the reading of the minutes was dispensed with.

The President announced the following committee on Rules: Messrs. Childs, Baxter and Manning.

Mr. Chase, the Superintendent of the State Fish Hatching establishment, was introduced by J. C. Holmes, Esq., and invited the members to visit the Hatchery during their meeting here.

The President read a letter from J. C. Holmes, Esq., announcing that J. W. Thompson would deliver a lecture before the Detroit Scientific Association this evening, on the Chemistry of some our barren lands, with illustrations, and invited the members of the Executive Committee to attend.

The invitation was accepted, and the thanks of the committee tendered to Mr. Holmes.

Mr. Baxter offered the following resolutions, which were adopted:

WHEREAS, The County Agricultural Societies of Michigan have a State organization which meets at Lansing this Wednesday evening;

AND WHEREAS, All such County Societies are by the Constitution of this Society made auxiliary to it, and more close and intimate relations between such Societies, and the Michigan State Agricultural Society are desirable to the end that all these organizations having in view the same great object of developing the agricultural, pomological, manufacturing and industrial interests of the State, may act in harmony, therefore—

Resolved, That the greetings of the State Agricultural Society be and they are hereby extended to the State organization of County Societies.

Resolved, That a committee of three members of this Executive Committee be appointed to attend the meeting of said State organization of County Societies to represent this Society.

Adopted.

The President named as such committee, Messrs. Childs, Cobb and Howard.

Mr. T. T. Lyon signified the acceptance by the State Pomological Society of the proposition of the Executive Committee in the following letter, which was placed on file:

DETROIT, MICH., January 15, 1879.

HON. W. L. WEBBER, *President Michigan State Agricultural Society:*

SIR:—On behalf of the Michigan State Pomological Society I hereby accept the proposition of your Executive Committee, that our Society assume the control and management of the Pomological Department of the contemplated annual State Fair for the year 1879, upon the terms expressed in the report of your committee of conference as adopted yesterday by your Executive Committee.

Very respectfully, T. T. LYON, *Pres.*

Mr. Fralick, from the Committee of Finance, submitted his report on the report of the Business Committee, which was as follows:

DETROIT, January 13, 1879.

The undersigned Finance Committe of the Michigan State Agricultural Society beg leave to report that they have examined the foregoing record of accounts and transactions of the Business Committee of said Society, and have compared the vouchers in the hands of the Secretary, and find the record to agree and the account correct, and in addition, that we have examined the report of said Committee of the amount received for rent of booths, peddlers' permits and property sold on the Fair grounds at the last annual Fair of said Society, and the name of the parties from whom received, and the amount thereof, and we further certify that they have paid the same to the Treasurer, and hold his receipt therefor, and for which he has rendered an account, and that we find the statements, vouchers, accounts and receipts correct in all respects.

All of which is respectfully submitted.

HENRY FRALICK,
F. V. SMITH,
E. W. RISING,
Finance Committee.

Accepted and adopted.

Mr. Fralick also made a report on the Treasurer's report, which was as follows:

DETROIT, January 13, 1879.

To the President and Executive Committee of the Michigan State Agricultural Society:

The undersigned, your Finance Committee, to whom was referred the foregoing account of the Treasurer of said Society, respectfully report that we have compared said account with the vouchers accompanying the same, and the stubs with the checks, and find them to agree, and the accounts correct; and we further report that we have examined the Treasurer's ticket account hereto annexed, and find that satisfactory and correct, and we recommend the various tickets now remaining on hand, viz.: 17,003 whole tickets, 4,665 children's tickets, and 2,250 grand stand tickets, in all 23,918, be destroyed.

All of which is respectfully submitted.

HENRY FRALICK,
E. W. RISING,
F. V. SMITH,
Finance Committee.

Accepted and adopted.

On motion of Mr. Baxter, the Finance Committee were authorized to destroy the dead tickets, as recommended in their report.

Mr. Baxter called up the resolution, now on the table, in relation to the highway law.

After discussion, the resolution was amended, so as to read as follows, and then adopted:

Resolved, That the Executive Committee of the State Agricultural Society, through the President and Secretary, present a memorial to the Legislature, asking for such change in the laws of the State relating to highway taxes as will secure expenditure of the same under such superintendence and control as will secure more profitable and valuable results.

Mr. Wood made a report on a protest relative to sheep in Division C, Class 21, and read several letters from Mrs. Newton.

On motion of Mr. Hanford, the protest was sustained and the request of the letters denied.

On motion of Mr. Beckwith, the committee adjourned until two o'clock P. M.

AFTERNOON SESSION.

The committee met pursuant to adjournment, President in chair.

The roll being called: on motion, the committee adjourned till three o'clock P. M.

The committee reassembled at three o'clock, the President in the chair.

Mr. Baxter, from Committee on Rules, submitted the following report:

The Committee on Rules to whom was referred a large number of recommendations of the President and also various recommendations of Superintendents of Divisions, would respectfully recommend the following amendments and additions to the Rules.

Amend Rule 1, of Rules and Regulations for government of Executive Committee by striking out the word "six" in third line and inserting the word "seven," and by adding after the words "Committee on Printing" the words, committee on reception to look after guests, visitors and strangers.

Amend Rule 1, Article 1, of General Rules and Regulations, by erasing the words, "and one admission ticket;" and inserting the words, with one coupon admission ticket attached.

Add to said Article 1, a new section to stand as section 3. Life members shall be

entitled to the same rights and privileges in all respects as other members of the Society. To entitle such life members to the privilege of voting, the certificates of life membership now held should be surrendered to the Secretary, who will furnish them with new certificates of the form herein provided, and the Secretary shall make a careful registry of certificates of life membership so issued, with number of certificate, date of issue and name of member, which register shall at all elections be placed in the hands of the inspectors of election, and shall be sufficient evidence of membership and right to vote, without the production at the polls of the Life Membership Certificate.

Certificates of life membership so issued and registered, shall be in the following form:

This certifies that............................is a Life Member of the Michigan State Agricultural Society.

Attest.

SEAL. ....*Secretary.* ....*President.*

[*Endorsement on Back.*]

This certificate when duly registered by the Secretary, entitles the person named therein to all the rights and privileges of a member of the Michigan State Agricultural Society.

Duly registered this........day of............. 18.

...........................*Secretary.*

Amend Rule 7, Article 2, officers, by adding to said rule as follows: Such Superintendents of each division shall be provided with a suitable office in the department of the hall and grounds assigned them, which shall be designated by appropriate and conspicuous signs.

Superintendents of departments requiring an assistant may appoint such assistant by and with the advice and consent of the President. Each superintendent of a department may also appoint a messenger, and if more than one messenger is considered necessary in any department, additional messengers may be appointed by and with the advice and consent of the President. Each superintendent of a department shall in person or by his assistant and messenger be present at his office during hours of exhibition.

Amend list of Executive Superintendents by striking out after "police," the words, "and gates," and add at end of list as follows:

"The gates and gate keepers, and the tickets taken up at the gates, shall be under the direction and control of the Finance Committee, who may make and cancel appointments of gate keepers, and shall have an office at the grounds convenient to the gates during the fair, etc." Gate keepers shall not be appointed from persons residing nearer the place of holding the fair than fifty miles.

Amend Article 2, clause 4, election of officers, by inserting after the word "member" in first line "other than life member," by adding between the words "shall" and "present" in the first line, the words "in person," so that said clause shall read, "each member, other than life members, desiring to vote, shall in person present a membership ticket, and adding a life member shall vote in person.

Amend Article 2, of same rules and regulations, by adding a new section to stand as section 12, page 22.

Section 12. No obligations against this society shall be created by any officers of the society or member of the excecutive committee, without the written consent of the President or Chairman of the Business Committee.

Amend Article 4, general rules and regulations, exhibitors, rule 4, as amended in 1878 (page 18, premium list 1878), so that the same will read as follows: "All entries in the division of cattle, horses, sheep, and swine, shall be made on or before Tuesday evening of the week preceding the fair, and in divisions E, H, and G, up to and including class 39, on or before Thursday evening of the week preceding the fair (the rest of the rule as amended 1878, page 18).

Amend Rule 12, Article 4, exhibitors, so that same shall read as follows:

12. The name and residence of the exhibitor and number of exhibit in the class, will be entered in Secretary's books upon entry cards and upon the books of the Viewing Committee.

Amend Rule 15, Article 4, Exhibited, by adding the following:

Superintendents will procure such attendants tickets at the office of the President, and each Executive Superintendent shall personally be at his office from 4 to 5 o'clock P. M., during each day of the fair, during which time exhibitors entitled to such attendant's tickets shall personally apply for the same, and the Superintendent shall keep a record of the names of such exhibitors and the number of tickets daily supplied to each.

So far as possible space in proper hall shall be assigned to each particular division and class, and articles entered for premiums must be assigned to the space thus set apart. The crowding of articles of an entirely different class and character into space thus set apart for any particular class should be avoided.

All other rules and regulations for 1878 not hereby amended or in conflict with amendments or regulations adopted by the Executive Committee at the present session shall remain in force.

On motion of Mr. Childs, the amendments were acted upon separately, and adopted.

Mr. Childs asked to be excused from further attendance at this meeting of the committee.

On motion of Mr. Beckwith, the request of Mr. Childs was granted.

Mr. Cobb, from the committee on that part of the President's address, in reference to the Agricultural College and its relations to this Society, submitted the following report:

To the President and Executive Committece of the Michigan State Agricultural Society:

GENTLEMEN—Your committee to whom was referred that portion of the President's inaugural, relative to the Agricultural College, respectfully report, that in the judgment of your committee, the recommendations are wise and timely; that more intimate relations should be cultivated between the Agricultural College and this Society, and offer the following recommendations: That the members of this Executive Committee make an annual visit to the College at such season of the year as the officers of the College may most desire to see them. The growing usefulness of the Agricultural College is a source of congratulation. Its origin was in the councils of this Society, and we look upon its prosperity with paternal pride. Its value to the agricultural interest of our State is now very generally recognized. Its value to the farmers of our State is shown in the experiments made by its professors, showing among other matters the value of the Clawson wheat as compared with other varieties, thereby enhancing its market price.

Your committee regard the Agricultural College and this Society as co-workers in a common cause, and feel assured and confident that such annual visits will cultivate a more intimate acquaintance, a heartier sympathy and result in mutual good.

Your committee would recommend that there be a veterinary department added to the College, that the students may have their education more fully completed.

Also would recommend that the State Board of Agriculture be more evenly distributed over the State.

All of which is respectfully submitted.

W. H. COBB,
F. V. SMITH.
G. W. PHILLIPS.

On motion of Mr. Beckwith the report of the committee was adopted.

Mr. Baxter from the Committee on Organic Laws of the Society, recommended the adoption of the following:

The committee to whom the portions of the President's address referring to to amendments the organic laws and legislation desirable, would respectfully recommend that application be made to the Legislature for amendments to the organic law in the following particulars:

Amend organic law so as to provide:

1st. That this Society may hold real and personal estate over and above its library, and its scientific and agricultural collections, to an amount not exceeding $100,000.

2d. That the Secretary and Treasurer shall give bonds in such amounts, with such sureties as shall be required by the Executive Committee; such bonds shall in the first instance be approved by the President, and his approval endorsed thereon, while such bonds and the action of the President thereon shall be reported and be subject to the action of the Executive Committee.

3d. Also, provide that the Society shall not be liable for loss by fire or otherwise of animals or articles while in charge of the Society for exhibition.

Your committee would recommend that the Secretary furnish the points on which amendments are desirable as above reported, to Hon. J. Webster Childs, and he be requested to introduce and endeavor to secure the passage of a law embracing these amendments. Respectfully submitted,

W. J. BAXTER, *Chairman.*

The report was adopted.

The Committee on Rules recommend the adoption of the following By-Laws:

The Secretary and Treasurer shall each within one month from this date, and hereafter on or before the second Monday in January in each year, and hereafter, give bonds conditioned for the faithful performance of the duties of the respective offices, and the accounting for and paying out of all moneys coming into their hands, respectively, and the delivery to their successors in office of all money, property and effects in their hands belonging to the Society, on or before the second Monday in January in each year.

The penalty of the bond of the Secretary shall be $1,000. The penalty of the bond of the Treasurer shall be $30,000.

Each of said officers shall furnish bonds with securities satisfactory to the Finance Committee, who shall endorse their approval on such bonds.

On motion of Mr. Sterling, the report was adopted.

Treasurer Dean presented his official bond, which, on motion of Mr. Sterling, was referred to the Finance Committee.

Mr. Rising, from the committee appointed to investigate the charges of Mr. Coller against H. O. Hanford, reported as follows:

To the Executive Committee of the State Agricultural Society of Michigan:

GENTLEMEN,—Your committee to investigate the charges of L. Coller against H. O. Hanford, superintendent of the department of farm machinery, wherein Mr. Hanford was accused of changing the award of the viewing committee on broadcast seeders at the fair of 1877, would respectfully report that they have given the same as full and careful consideration as circumstances would permit; and from the letters of the viewing committee which were before us, and which we submit with this report, and from the personal statements of Mr. Pettengill, the chairman of that committee, assuming all the blame in the transaction, your committee can come to no other conclusion than that Mr. Hanford knew nothing of the change at the time, but that the change was made by the committee, and the books returned by them to the secretary's office and not to Mr. Hanford, as charged by Mr. Coller.

We therefore are of the opinion that Mr. Hanford should be fully exonerated from all blame in the matter by the Executive Committee, and that this report, together with the accompanying letters, should be as widely published as were the charges of Mr. Coller. And we recommend that the "Michigan Farmer" and the "Flint Citizen" be requested to publish the same.

All of which is respectfully submitted.

E. W. RISING,
J. Q. A. BURRINGTON,
H. A. KIPP,
Committee.

On motion of Mr. Sterling, the report was adopted and the secretary instructed to have the same published in the "Michigan Farmer" and "Flint Citizen," as recommended.

On motion of Mr. Sterling, the date for holding the next State fair, was fixed for Monday, September 15th, 1879.

On motion the committee then adjourned to meet at 7:30 P. M.

EVENING SESSION.

The committee reassembled at 7:30 P. M.

President Webber in the chair.

Present—Messrs. Angel, Burrington, Dewey, Hanford, Howard, Manning, Smith, Wood, Ball, Cobb, Fralick, Hyde, Kipp, Parsons, Phillips, Rising, Sterling, M. Shoemaker, W. G. Beckwith, W. J. Baxter, E. O. Humphrey, the Treasurer, Secretary, and the President.

Mr. Humphrey, from the Committee on Premium List, submitted the following:

The Premium List Committee would make the following recommendations and ask their adoption:

That all thoroughbred cattle shall be judged by a scale of points to be prepared under the direction of the Superintendent of that department.

That a complete set of the American Short-horn Herd-books as published by Messrs. Allen and Baily, a set of the American Devon Herd-books, and of the Herd Register of the American Jersey Cattle Club, be purchased for the society by the secretary, to be kept in his office.

That wherever the word "buck" occurs in the premium list that the word ram shall be inserted in its place.

That all animals entered in Divisions A, B, C, and D, must be owned by the exhibitor and in his possession at least three months previous to the fair.

Adopted.

Mr. Humphrey then submitted the premium list as revised by the committee.

Moved by Mr. Baxter, that the report of the committee in Class I, Division A, be referred back with instructions to so amend that the total amount offered in premiums for 1879, shall not exceed the total amount offered in 1878.

On a call for the ayes and nays the members voted as follows:

Ayes—Messrs. Angel, Howard, Smith, Cobb, Kipp, Parsons, Sterling, Shoemaker, Beckwith, Baxter, and the Secretary and President—12.

Nays—Messrs. Burrington, Dewey, Hanford, Manning, Wood, Ball, Fralick, Hyde, Phillips, Rising, Humphrey, and the Treasurer—12.

Lost.

Moved by Mr. Baxter, that the report of the committee on Division A be referred back with instructions to so amend that the total amount in premiums for 1879 shall not exceed the total amount offered in 1878.

On the call for the ayes and nays the members voted as follows:

Ayes—Messrs. Angel, Howard, Smith, Fralick, Kipp, Parsons, Sterling, Shoemaker, Beckwith, Baxter—10.

Nays—Messrs. Burrington, Dewey, Hanford, Manning, Wood, Ball, Cobb, Hyde, Phillips, Rising, Humphrey, and the president and treasurer—13.

Mr. Baxter moved that the report of the committee be so amended that the sum offered for premiums on herds for 1879 shall not exceed the sum offered in 1878; except that an extra premium be offered for Holstein herds of the same amount now offered for Devon herds.

On a call for the ayes and nays the members voted as follows:

Ayes—Messrs. Angel, Burrington, Howard, Smith, Cobb, Fralick, Kipp, Parsons, Sterling, Shoemaker and Beckwith—11.

Nays—Messrs. Dewey, Hanford, Manning, Wood, Ball, Hyde, Phillips, Rising, Humphrey and the President and Treasurer—11.

Lost.

Mr. Fralick moved that the report of the Committee on Premiums on the first 11 Classes, Division A, including premiums, be adopted.

Carried.

Mr. Fralick moved to that the report of the Committee on Shorthorns be adopted as it is reported.

Carried.

Mr. Fralick moved that the report of the Committee on Division A be changed, so as that the premiums shall remain as they were in 1878, with the addition of a class for Holsteins equal to the Devons.

Adopted.

HORSES.

Moved by Mr. Baxter, that Class 12, Division B, remain the same as last year with the addition of suitable premiums for yearling colts.

Mr. Baxter withdrew his motion.

Mr. Fralick moved that the report of the Committee on Division B, Classes 17 and 17½ be non-concurred in, and that the premiums in these Classes remain the same as last year.

Adopted as follows:

Ayes—Messrs. Angel, Burrington, Dewey, Howard, Manning, Smith, Cobb, Fralick, Kipp, Parsons, Sterling, Shoemaker, Baxter and the Treasurer and Secretary—15.

Nays—Messrs. Hanford, Wood, Ball, Hyde, Phillips, Rising, Beckwith, Humphrey and the President—9.

Moved by Mr. Dewey, that Classes 11, 12, 13, 14, 15 and 16, as in the premium list of 1878, be substituted in place of the report of the committee.

Adopted.

Moved by Mr. Sterling, that all action on Division B be reconsiered.

Moved by Mr. Baxter, that the motion to reconsider be laid on the table.

Lost.

On motion, the Committee adjourned until 9 o'clock Thursday morning.

Approved.

W. L. WEBBER, *President.*

FOURTH DAY.

Thursday Morning, January 16, 1879.

The Committee met at 9 o'cock A. M.

President Webber in the chair.

Present, Messrs. Angel, Burrington, Dewey, Hanford, Howard, Manning, Smith, Wood, Ball, Cobb, Fralick, Hyde, Kipp, Parsons, Phillips, Rising, Sterling, M. Shoemaker, W. G. Beckwith, W. J. Baxter, the Treasurer, Secretary, and the President.

The minutes of yesterday's proceedings were read, corrected and approved.

Mr. Sterling, from the Special Committe on County and other Agricultural Societies, submitted the following report:

The Special Committee on county and other agricultural societies, to whom were referred reports received by the Secretary from such societies, would respectfully report: That during the past year, and since your last winter meeting, the number of county and other agricultural societies that under our constitution and in contemplation of law, should be auxiliary to and in close connection with the Michigan State Agricultural Society, and from which our society should receive annual reports, have increased from 55 to 61, though a portion of this increase is due to reorganization of old societies under new names. The actual number from which we should have received reports, is, we believe, 58. Of these 27 have furnished reports or communications as against six reports received from local societies last year.

This is a very gratifying result and evinces a growing interest on the part of such societies, in the State Society, whose constant aim and object should be to encourage the formation of such county societies, and in every possible way to aid them in their efforts to develop the agricultural, horticultural, pomological, mechanical and industrial interests of their respective localities.

These annual reports indicate the various methods employed and the success attending them, and enables the State society, through its officers, and exhibitions, to

give wider knowledge of more general adoption of valuable improvements and methods, and by interchange of views and kindly criticisms, to correct imperfect or faulty methods and plans for organizing such societies and for conducting annual exhibitions.

Your committee are of the opinion that every effort should be made by the officers of this society and the members of the Executive committee, and through committees appointed to attend the annual meetings and exhibitions of these county and district societies, to secure on our part increased knowledge of what they are doing, and on their part greater confidence in and more hearty coöperation with the State society, in its efforts to promote the common cause in the State.

County exhibits, in various departments, are inactive at our annual fairs, and it is to be hoped that these county and district societies will be induced more and more frequently to avail themselves of these opportunities to make such an exhibition at these state fairs as will reflect credit on their respective localities and on the State.

Reports have been received from several societies, and reports of organization of new societies and reorganization of old societies to the number of six.

The reports presented from the several county societies show a gratifying increase in the number of entries at each, and in the amounts offered and awarded as premiums.

We have reason to believe that these reports of county and district societies will from year to year become more valuable and instructive, as affording hints and indications enabling us to perfect our annual premium lists by the addition of articles and classes to meet the wants and encourage the production of new and varied industries.

Respectfully submitted.

J. M. STERLING,
M. SHOEMAKER,
H. A. KIPP,
Committee.

Accepted and adopted.

President Webber, from the committee on considering the propriety of asking the State Legislature to have the reports of the Society printed separately, asked until the next meeting of the committee to report on the same.

Leave granted.

Mr. Fralick, from the special committee to investigate the charges made in the "Evening News" of September 21, 1878, submitted the following:

To the President and members of the Michigan State Agricultural Society:

GENTLEMEN,—At the close of the last annual fair of this Society, there appeared in the Detroit "Evening News" an article charging certain members of the Executive Committee and officers of this Society with misconduct and corruption. The paper in question referred to Mr. Thompson, Secretary of this Society for the facts to sustain these charges. The officers of the Society deferred any action or public notice of them until the present winter meeting of the Executive Committee. On the 13th inst., the first day of the meeting, Mr. A. J. Dean, the Treasurer of the Society, asked for an investigation of said charges by a special committee, Pending the action of the Executive Committee on that request, Mr. J. P. Thompson, the outgoing secretary, reiterated some of the charges that had been published in the "Evening News" in September last. On motion, Henry Fralick, Philo Parsons and F. V. Smith were appointed such committee. They immediately notified Mr. Thompson to appear before them, present his charges in writing, with his evidence to sustain the same. They also notified Mr. Dean and others to appear and make their defense. Mr. Thompson appeared and submitted his charges, specifications and the evidence to substantiate them in writing, which are hereto attached, and contains what he calls nine charges, as follows:

SPECIFICATIONS OF CHARGES AND EXPLANATIONS BY EX-SECRETARY THOMPSON, RELATIVE TO CHARGES MADE AGAINST MR. DEAN, TREASURER, AND OTHER OFFICERS AND MEMBERS OF THE SOCIETY.

1st. I charge that Mr. Dean was Treasurer of the Society and was at the same time an acting member of the Committee on Printing, and that he procured the printing of his admission tickets. *Admitted.*

2d. I charge that Mr. Dean was Treasurer of the Society and was at the same time

an active member of the Committee on Gates, both at Detroit and Jackson fairs. *Admitted.*

3d. I charge that these positions on the part of the Treasurer were liable to misconstruction, and liable to subject him to unfavorable criticism. At the same time they are *not incompatible* with the strictest integrity. *Admitted.*

4th. I charge that in addition to the printing, selling and taking up of his admission tickets, that he had knowledge of the burning of the tickets taken at the last Jackson fair, on the Monday succeeding the fair. *Admitted.*

5th. I charge that these tickets so printed, sold and taken up and destroyed had never been counted. *Admitted only in part.*

In explanation of the two last specifications, it is stated and I believe it to be a fact, that this was the usual practice, and involves no malfeasance of any officer.

Gentlemen—I find the following paragraph in the address of the President:

"During the week of the fair the duties of the treasurer of the Society are exceedingly arduous, and greater than should be imposed upon any one man. My connection heretofore with the Business Committee has, I believe, given me opportunities to speak intelligently concerning this subject. I believe that our treasurer has honestly and intelligently performed his duty. Some unfavorable criticism was indulged in concerning him during our last fair, doubtless emanating from those who were not aware of the real facts. But for the purpose of relieving him of a portion of the labor heretofore cast upon him, and also for the purpose of furnishing more effectual checks in the management of the financial business of the Society, I recommend that the Finance Committee be instructed and empowered to take charge of the gates and to appoint gate-keepers, and to attend to the collection and counting of the tickets received at the gates, thus leaving the treasurer free to devote his time to the supervision of the selling of tickets and the care of the funds."

I most cheerfully and heartily endorse this recommendation. It is not my aim or desire to attack individuals. It is the system that is wrong and should be reformed. By the system I mean the practice of allowing the treasurer to print his own tickets, to sell them and to place the gate-keepers who take up the tickets. Such a system is liable to abuse and all that I ask is that the system be changed. It would give better satisfaction should the treasurer have nothing to do with printing the tickets of admission or placing the gate-keepers. If the recommendation of the President is carried out I think it will be satisfactory to all concerned. In regard to the Detroit Fair, I did think that $33,000 and a little over was a small sum to be received at the gate at 50 cents admission for adults. I saw that every avenue and that every house and that the streets were crowded, and when I considered the population of the city and State I was led to estimate the receipts at a higher figure. In making this estimate some gentlemen connected with the Society as officers *thought* I impugned their personal integrity. I had no such intention, and if they think so I desire to withdraw any charges involving any officer of the Society relating to the fair of 1878. I do not attack individuals. I attack the system which is liable to abuse.

STATEMENT RELATIVE TO THE NEWS ARTICLE.

In relation to the article published in the daily "News" of September 21st, of which the following is an extract:

"Mr. J. P. Thompson, the outgoing secretary, says that very much more than $35,000 ought to have been taken. He estimates that in the five days at least 120,000 people visited the fair, 90 per cent. of whom at least should have paid full rates. At the smallest calculation $50,000 should have been gathered in. At Grand Rapids five years ago, where the fair was not half as large as this week, the receipts were $28,000."

I think the reporter of the "News" was correct in his report of the interview. But subsequent evidence has satisfied me that I was mistaken. The large number of complimentaries accounts for several thousand people. The number of passes to exhibitors and attendants was quite large. We are all liable to over-estimate crowds of people. There was an immense fair, and the general impression was that the receipts at the gates would amount to $40,000—some put it as high as $50,000. There seemed to be a general belief that there were at least 100,000 people at the fair, and I was resting under the impression that the attendance was much larger than at the Grand Rapids fair. Now if there is any officer of the fair who thinks this statement in the "News" impugns his personal integrity, I desire to withdraw it.

If Mr. Dean feels as if the statement impugns his honesty and integrity, I desire to withdraw it. I do not charge individuals with dishonesty, but the system I charge with being liable to abuse.

In regard to this statement made in the daily "News" as follows:

"Think of that," said Mr. Thompson. "I tell you that the State fair ring is a rotten one of the very worst kind, and it was because I wouldn't knuckle down to them that they ran me out of the secretaryship. They say in the papers that they do not know what to do with their surplus. It will go where it will do the ring the most good. When my accounts are audited I will make such an exposure of the inside workings of the men who engineer the State fair as will astound the people of Michigan."

I will say that I referred to the *system* of the society which allowed the Treasurer to be an active member of the committee on printing and gates. I felt then that under such a system it is possible that great fraud can be committed. I felt that it is possible that a large amount of money may be abstracted without detection. The exposure which I purposed to make was this system of the society. I was laboring under the impression that it might be possible for officers of the society to take advantage of their positions. But I may have been mistaken and probably was. If Mr. Dean or any other member or officer of the society believes that this statement impugns his integrity or honor I wish to withdraw any such imputation. I have no wish to make any charge of corruption against any individual of the society and do not make any such charge. The charge that I make is that the system is wrong, liable to abuse and ought to be reformed.

(Signed.) J. P. THOMPSON.

Your committee in answer to the foregoing general charge that the system or rules and regulations under which the society has heretofore done its business are wrong, liable to abuse, and ought to be changed, are so vague, indefinite and puerile that time would be wasted in their consideration in other respects. The President, in his inaugural, has recommended changes which have been adopted that will fully protect the society from any corrupt invasion of its rights. Your committee further state while Mr. Dean, as a member of the Printing Committee, by direction of his associates, did procure the printing of the tickets for the two fairs of 1877 and 1878, they were in each case printed by O. S. Gully & Co., of this city. They were all printed and packed in consecutive numbers from one to the highest number, the numbering being done in the same manner as railroad tickets, by a peculiar press of which there is no duplicate. That said tickets, both for the fairs of 1877 and 1878 were all examined and counted by Henry Fralick, Chairman of the Finance Committee, at the commencement and ending of each fair, the whole number being charged to the Treasurer, and those not sold credited when returned. The balance being fully accounted for by said Treasurer. The Finance Committee, as has been customary for several years, recommended that the tickets remaining on hand be destroyed, which, at Jackson in 1877, was done publicly and in the presence of Mr. Thompson, the Secretary. The tickets for 1878 were carefully counted and examined by the Chairman of the Finance Committee before delivering to the Treasurer, and those remaining unsold at the close of the fair were re-counted by him, the balance being paid for by Mr. Dean, the Treasurer. To secure a further check said Finance Committee obtained from Messrs. O, S. Gulley & Co. their affidavit of the number and kinds of tickets printed for said Society for the year 1878, which correspond with the number and kinds delivered to the Treasurer for the fair of 1878. The committee have further verified the integrity of the Treasurer by a re-count of all the tickets taken during the fair to ascertain if more tickets were used than the Treasurer reported sold, and find the number of all kinds much less than the Treasurer has accounted and paid for. The Treasurer reports and pays for all tickets counted to him and not redelivered in their order, and thereby takes all the risk of loss in change, bad money, or any other errors, to which there is great liablity in the haste and confusion at the gates. Mr. Dean has been for the last two years on the Committee of Police and Gates, but not the chairman. It seems a necessity for him to be on that Committee, and have charge of the men at the gates; but that is hereafter to be changed. At the opening of the fair, locked boxes are placed at each gate to receive the tickets as taken from those entering the grounds. The positive rule requires an immediate deposit of the tickets in these locked boxes, the key of which is kept by the chairman of the Business Committee, hereafter to be kept by the Finance Committee, and the boxes are not to be opened until the close of the year. The tickets remaining in the hands of the Treasurer are returned, and the account adjusted by the Finance Committee, the Treasurer having at no time access to the boxes. Thus much for the manner in which the business of the society in reference to this department has been conducted. The charges of corruption by any person connected with the Society having been withdrawn, your Committee deem it unnecessary to enlarge further upon it, but feel it a pleasure to state that they find ample proof in the examination of Mr. Dean's accounts of his integrity,

and feel that every dollar belonging to the Society has been honestly accounted for. For his important, faithful and laborious services as Treasurer, he is entitled to the best thanks of the Society, which we unanimously ask in his behalf. We greatly regret that any person with sufficient character and standing to be elected Secretary of this Society, should have thought it either proper or just to make such serious charges against the officers of a Society so eminently of, and belonging to, the people of the State, with so little cause. All of which is respectfully submitted.

HENRY FRALICK,
PHILO PARSONS,
F. V. SMITH,
Committee.

The report was unanimously adopted.

The President announced the following standing committees:

Business—Sterling, Hyde, and Manning.
Finance—Fralick, Smith, and Rising.
Reception—Parsons, Beckwith, and Shoemaker.

Mr. Phillips offered the following resolution:

Resolved, That the Executive Committee do now adjourn, to meet at Lansing, on the 25th of February, 1879, at 12 o'clock noon.

The ayes and nays being called for, the resolution did not prevail, by the following vote:

Ayes—Messrs. Wood, Fralick, Phillips, Beckwith, Baxter, and the President and Treasurer—7.

Nays—Messrs. Angel, Burrington, Dewey, Howard, Manning, Smith, Ball, Hyde, Kipp, Parsons, Rising, Sterling, and the Secretary—13.

Mr. Baxter addressed the committee on the subject of restricting the entries of live stock exclusively to Michigan.

Moved by Mr. Wood, that all action taken by the committee on the report of the Committee on Premium List be reconsidered.

Adopted.

Moved by Mr. Dewey, that the subject matter of the Premium List, with instructions to report at the earliest moment practicable, be referred to the Committee on the Premium List.

Mr. Phillips moved as a substitute that the Committee on Premium List be discharged.

Not adopted.

The motion of Mr. Dewey was then adopted.

Mr. Fralick, from the Finance Committee, reported that the treasurer had submitted his official bond and that it had been approved by the committee, and recommended its acceptance.

The report of the committee was adopted, and the bond of the treasurer was delivered to the secretary to be filed.

On motion the committee adjourned until 3 o'clock P. M.

AFTERNOON SESSION.

The Committee met pursuant to adjournment, the President in the chair.

No quorum present.

Adjourned until 4 o'clock.

Further adjourned until 5 o'clock.

Further adjourned until 7 o'clock P. M.

EVENING SESSION.

The Committee met at 7 P. M.

President Webber in the chair.

Present, Messrs. Angel, Burrington, Dewey, Hanford, Howard, Manning, Smith, Wood, Ball, Cobb, Fralick, Hyde, Kipp, Parsons, Phillips, Rising, Sterling, M. Shoemaker, W. G. Beckwith, W. J. Baxter, the Treasurer, Secretary and the President.

Moved by Mr. Hyde that a Committee on State Fair Programme be appointed.

Adopted.

The President announced as such committee Messrs. Hyde, Dean and Smith.

Mr. Phillips, from the Committee on Premium List, submitted the following report:

The Premium List Committee would respectfully make the following recommendations, and ask their adoption:

That all animals, except those entered for herd premiums, must be owned in this State.

That all exhibits in Divisions A, B, C, D and E must be owned by the exhibitor and in his possession at least three months previous to the fair.

That all animals entered as thoroughbreds in Division A shall be judged by a scale of points to be arranged under the direction of the superintendent in charge of that department.

That the Superintendent of Division A shall appoint a special Committee on Pedigrees.

That no animal entered as thoroughbred in Division A shall be admissible to the showing without a certificate of eligibility from the Committee on Pedigrees.

That a complete set of the American Shorthorn Herd Books, published by Messrs. Allen & Bailey, the American Devon Herd Books, and the Herd Register of the American Jersey Cattle Club, be purchased for the Society by the Secretary, and kept in his office.

That wherever the word "buck" appears in the premium list, that it be stricken out and the word "ram" inserted.

Mr. Smith moved that the rule excluding foreign stock from competition in the different classes be so amended that all classes, excepting in the herd class, shall be open to foreign entry.

The amendment was not concurred in.

The report of the Committee on Premium List was then read by divisions and adopted.

The report as a whole then came before the Committee and was adopted.

Mr. Shoemaker moved to rescind the rule confining exhibits to cattle owned in the State.

On a call for the ayes and nays the motion was lost, as follows:

Ayes—Messrs. Smith, Fralick, Parsons, Sterling, Shoemaker, Beckwith, Baxter, the Secretary, Treasurer and President—10.

Nays—Messrs. Angel, Burrington, Dewey, Howard, Manning, Wood, Ball, Hyde, H. A. Kipp, Phillips and Rising—11.

Mr. Fralick, from the Committee on Finance, reported that the report of the Secretary had been examined and found correct.

The report was accepted and adopted.

Mr. Parsons offered the following resolution:

Resolved, That the President be authorized to invite some distinguished citizen to deliver an address before the Society at its next annual exhibition.

On motion, the resolution was referred to the President and Business Committee.

Mr. Ball presented the request of the State Wool Growers' and Sheep Breeders' Association for a donation of $500, to aid in holding a sheep shearing festival at Jackson.

The subject was discussed, and the following resolution offered by Mr. Ball:

Resolved, That an appropriation of $500 be made to the State Wool Growers' and Sheep Breeders' Association, to aid in a Sheep Shearing Festival at Jackson.

Lost.

Mr. Parsons, from the Special Committee on Unsettled Accounts, submitted the following report:

To the President and Executive Committee of the State Agricultural Society:

GENTLEMEN:—Your Committee to whom was referred certain accounts not paid by the Business Committee, would report that they have given the accounts consideration, and would recommend that the account of J. B. Hinchman be paid; that the late Secretary be paid for six days' service, at the rate of $1,000 per year, and that the account of Mr. Field be referred to the Committee of the Whole.

PHILO PARSONS,
HENRY KIPP,
HENRY FRALICK,
Committee.

On motion, the report was accepted and the recommendations therein were adopted.

On motion of Mr. Fralick, the Treasurer was instructed to pay Mr. Field the sum of $150.00, on condition that Mr. Field give a receipt for the whole amount of his claim.

Adopted.

Moved by Mr. Smith, that a committee consisting of Messrs. Parsons, the Secretary, and Mr. Sterling, be appointed to procure a suitable office for the use of the Society, with full power.

Mr. Sterling presented a claim of S. D. Meder.

On motion, the claim was laid on the table.

The subject of the present system of doing business by the Society was discussed.

Moved by Mr. Sterling, that the preparation of Vouchers for Premium Checks, and the question of a set of books for the accounts of the Society, be referred to the Committee on Finance with full power to take such action as they shall deem necessary to promote the best interests of the Society.

Adopted.

Mr. Baxter offered the following resolution, which was adopted:

Resolved, That the Secretary shall cause to be prepared blank forms of reports for Viewing Committees, and at each fair he shall furnish the Superintendents of the several departments with a sufficient number for use.

Moved by Mr. Parsons, that a committee of three members and the President be appointed to locate the Fair of 1879.

Adopted.

The President appointed as such committee, Messrs. Parsons, Sterling, and Fralick.

The President then announced the following Superintendents of Departments and Standing Committees for the State Fair of 1879:

Cattle—Messrs. Phillips and H. A. Kipp.
Horses—Messrs. Hyde and Howard.
Sheep—Mr. Burrington.
Swine—Mr. Wood.
Poultry—Mr. Dewey.
Miscellaneous—Mr. Childs.

Farm Implements—Messrs. Hanford and Angel.
Fine Arts—Messrs. Baxter and Parsons.
Music, etc.—Mr. Cobb.
Manufacturing—Mr. Smith.
Agricultural—Mr. Blodgett.
Dairy, etc.—Mr. Chas. Kipp.
Machinery—Mr. Ferry.
Vehicles, etc.—Mr. Ball.
Police—Messrs. Sterling and Fralick.
Forage—Mr. Rising.
General Superintendent and Chief Marshal—Mr. Beckwith.
Committee on Printing—Messrs. Parsons, Cobb and the Secretary.
Committee on Transportation—Messrs. Sterling, Fralick and Cobb.

Mr. Fralick offered the following resolution:

Resolved, That the salary of the Secretary of this Society be fixed at the sum of $1,000 for the current year.

Adopted.

Mr. Baxter asked to be excused from serving as one of the Superintendents of Fine Art Department.

On motion, the request was granted.

Mr. Baxter offered the following resolution, which was unanimously adopted:

Resolved, That the thanks of the Executive Committee are hereby tendered to E. O. Humphrey, Esq., our late President, who retires from the Chair he has occupied for the past four years, with our esteem and respect, for the long continued energy and devotion he has given to all the interests of the Society which we have the honor to represent, and with which he has been connected for the past twelve years.

Mr. C. W. Greene was invited to address the Committee on the general interests of the State Agricultural Society, and made an address replete with historical incidents and allusions.

Mr. Dean offered the following resolution, which was adopted:

Resolved, That the Secretary be instructed to have 1,000 copies of the proceedings of the annual meeting printed, and that 25 copies be furnished to each member of the Executive Committee.

On motion, the Executive Committee adjourned *sine die*.

W. L. WEBBER, *President*.

R. F. JOHNSTONE, *Secretary*.

STATEMENT A.

STATEMENT OF THE BUSINESS COMMITTEE, IN DETAIL, TO THE EXECUTIVE COMMITTEE OF THE MICHIGAN STATE AGRICULTURAL SOCIETY, MADE JANUARY 13, 1879, AT THE ANNUAL MEETING.

State Pomological Society.

Date.	No. of Order.		Total.
Jan. 11,	1		$400 00
Feb. 25,	31		300 00
July 27,	118		300 00
Sep. 20,	170		300 00
Nov. 4,	344		300 00
Dec. 9,	355		200 00
		Total	$1,800 00

Expenses of Lawsuit.

Jan. 11,	4	Costs of East Saginaw Driving Park	$10 30

Forage.

Jan. 11,	5	Stabling at Jackson, 1877	$6 00
Sep. 21,	173	Stabling at Detroit, 1878	3 00
Sep. 20,	186	Hay	114 33
20,	187	Hay and straw	915 00
21,	189	Outside stabling	7 00
21,	213	Outside stabling	14 50
21,	220	Hay and straw	73 90
21,	232	Outside stabling	5 50
24,	241	“ “	20 00
21,	295	“ “	4 00
Oct. 24,	332	Oats for Police and Marshal's horses,	17 00
		Total	$1,180 23

Locating Committee.

Mar. 15,	33	Russell House	$67 50
Ap'l 12,	38	Expenses	7 00
May 1,	41	Russell House	11 50
31,	63	Expenses	19 70
		Total	$105 70

Expenses of Executive Committee.

Date.	No. of Order.		Total.
Jan. 11,	2	Postage & expenses	$14 28
Ap'l 12,	36	Letter heads	19 90
Aug 20,	136	J. M. Sterling	24 50
Sep. 20,	171	J. Q. A. Burrington,	8 50
20,	172	A. O. Hyde	14 19
17,	181	Chas. McM	17 30
30,	184	J. G. Ramsdell	21 85
21,	185	D. A. Blodgett	7 00
21,	190	A. F. Wood	6 30
Sep. 20,	191	Abel Angel	$8 60
21,	196	F. M. Manning	24 00
21,	199	J. W. Childs	9 85
21,	200	“ “	6 40
21,	201	“ “	12 55
21,	202	Henry Fralick	14 50
24,	209	W. M. Ferry	16 10
21,	218	H. O. Hanford	19 65
21,	219	E. W. Rising	10 75
21,	221	D. W. Howard	20 60
21,	238	G. S. Wormer	8 80
18,	243	W. H. Todd & Co.	20 00
Jan. 24,	249	W. J. Baxter	15 80
21,	283	G. W. Phillips	16 80
25,	288	Ex Business Com.	25 00
Nov. 9,	346	T. D. Dewey	26 68
9,	347	F. V. Smith	17 30
25,	349	W. G. Beckwith	15 00
Jan. 11,	3	W. L. Webber	5 25
Ap'l 12,	37	Postage stamps	11 00
July 1,	95	J. M. Sterling	28 50
29,	111	J. M. Sterling	22 00
Jan. 13,	365	President's exp'ses for 1878	15 00
13,	374	J. M. Sterling	12 90
		Total	$516 85

Ribbons and Badges.

Sep. 21,	177	Premium ribbons	$16 35
24,	286	Ribbons and badges	23 50
		Total	$39 85

Police and Gates.

Sep. 21,	178	Charles Rich	$9 00
21,	179	Frank Buckland	9 00
23,	226	G. Horsick	10 00
23,	227	W. H. Dewey	40 50
23,	231	M. Stevens & Co.	16 60
23,	252	Sterling & Dean	141 90
23,	299	Paid men	213 25
		Total	$440 25

Yellow Fever Sufferers.

Sep. 21,	211		$500 00
		Total	$500 00

Right of Way.

Date.	No. of Order.		Total.
Sep. 21,	217	W. Rickey	$50 00
		Total	$50 00

Use of Land.

Sep. 24,	223	O. C. Thompson	$75 00
Dec. 9,	352	C. R. Mabley	25 00
		Total	$100 00

Music.

Sep. 23,	220	Jonathan Cohart	$68 00
		Total	$68 00

Steam Power and Shafting.

Sep. 23,	235		$395 00
23,	236	Power in Mechanic Hall	575 00
23,	237	Fuel	6 00
		Total	$976 00

Livery.

Sep. 24,	285	D. O. Conner	$52 00
		Total	$52 00

Freight.

Sep. 21,	293	M. C. R. R.	$1 82
Oct. 24,	324	R. R. charges paid by Beckford	5 52
24,	334	M. C. R. R. switching	343 00
Jan. 13,	367	R. R. freight, O. M. Fuller	19 00
13,	368	Charles Blanchard	38 00
13,	369	Switching refunded	200 00
		Total	$607 34

Meal Tickets.

Sep. 24,	301		$471 69
		Total	471 69

Names of Parties Paid.

W. H. Dewey	$205 66
W. Bodin & Co	21 66
Goodenough	1 00
Hames & Baker	9 66
Thompson & Dunn	6 33
Brush	19 00
Charles Wheeler	12 00
Crossman & Hutchins	20 00
Baptist Church	31 00
D. Cole	1 00
Burton & Rhodes	33
George Smith	1 66
Smith & Gettes	5 00
Hammon & Smith	26 00
Deadman	33
Kean & Button	4 04
Wharf	2 00
Mrs. Wood	$1 33
M. Martz	7 00
Rupel & Bro	2 00
A. Grant	33
G. Owen & Co	55 33
Wiggins & Co	1 33
Jonathan Vhey	66
Gardiner & Baker	2 33
Gilman & Bros	4 66
Richard	15 66
G. M. Schafler	6 00
L. G. Patterage	1 66
Unknown	6 77

Decoration and Banners.

Date.	No. of Order.		Total.
Oct. 24,	318	Guy Hinchman	$79 91
24,	320	J. M. Sterling & Son	8 75
24,	322	Painting signs	3 40
24,	323	Trimming hall	18 31
		Total	$110 37

Medals and Diplomas.

Oct. 29,	337	Medals	$289 45
29,	338	Diplomas	30 00
Dec. 27,	360	Medals	47 00
Jan. 6,	362	Engraving medals	68 00
13,	373	E. B. Smith & Co.	9 50
		Total	$443 95

Expenses—Winter Meeting.

Jan. 11,	6	C. Dickie	7 55
11,	7	E. W. Rising	7 00
11,	8	G. W. Childs	4 95
11,	9	A. F. Wood	5 05
11,	10	W. M. Ferry	7 70
11,	11	G. Q. A. Burrington	5 50
11,	12	A. J. Dean	6 55
11,	13	W. J. Baxter	2 50
11,	14	H. O. Hanford	3 15
11,	15	F. M. Manning	10 80
11,	16	D. W. Howard	17 10
11,	17	Col. M. Shoemaker	3 00
11,	18	G. W. Phillips	5 80
11,	19	T. D. Dewey	4 00
11,	20	Abel Angel	7 10
11,	21	Hotel bill	234 40
11,	22	F. V. Smith	6 15
11,	23	J. G. Ramsdell	19 35
11,	24	J. M. Sterling	3 13
Feb. 28,	27	A. O. Hyde	3 00
		Total	$363 17

Superintendent's Assistants.

Sep. 21,	174	Asst. Marshal	$105 00
21,	203	Henry Fralick	28 75
21,	208	Dean, Brow & Co.	65 00
Oct. 24,	333	Asst. supt. of sheep	3 85
Dec. 9,	353	Asst. supt. of sheep	13 05
		Total	$215 65

Secretary's Office.

Date.	No. of Order.		Total.
Jan. 11,	25	Postage	$17 33
11,	26	Salary	83 33
Feb. 16,	30	Postage	19 75
28,	32	Salary	83 33
Mar. 31,	34	Salary	83 33
Ap'l 12,	35	Postage	12 00
12,	39	Stationery	8 35
May 1,	40	Salary	83 33
10,	52	Michigan Farmer	16 27
31,	62	Salary	83 33
31,	69	Postage	15 75
July 1,	89	Salary	83 33
31,	114	Salary	83 33
31,	117	Postage	15 50
Sep. 4,	168	Salary and office expenses	121 37
20,	169	G. W. Cottrell	25 00
20,	233	Dewey and Swan	9 33
23,	248	Stationery	10 70
23,	254	Office rent	50 00
Aug. 7,	225	G. P. Thompson	108 85
19,	256	A. O. Merrill	15 25
19,	257	B. G. Gibbons	30 00
19,	258	G. C. C. Hanford	21 25
19,	259	M. J. McDowd	11 75
19,	260	H. M. Park	32 75
19,	261	H. S. Starkey	15 00
21,	262	A. B. Moore	9 25
14,	263	J. P. Thompson	10 30
13,	264	J. S. Tibbetts	5 00
5,	265	M. J. McDowd	8 00
10,	266	Detroit post office	8 00
5,	267	J. B. Hinchman	5 50
7,	268	W. L. Miller	50
9,	269	H. M. Park	8 00
14,	271	A. B. Moore	13 75
Jan. 13,	371	Rent	50 00
14,	272	O. A. Merrill	13 75
14,	273	J. B. Hinchman	16 26
14,	274	M. J. McDowd	17 50
14,	275	L. B. Parsons	16 00
19,	276	Office rent	12 50
19,	277	A. B. Moore	10 75
19,	278	L. C. E. Hanford	12 50
19,	279	L. B. Parsons	14 25
19,	280	J. B. Hinchman	15 25
24,	287	Office expenses	33 00
26,	304	T. G. Conely	58 30
26,	305	O. A. Merrill	15 00
26,	306	Salary	83 33
26,	307	Board of clerk	12 00
26,	308	T. G. Conely	89 74
26,	309	Freight on books	1 91
Oct. 7,	310	W. G. Gibson	60 00
7,	311	O. A. Merrill	15 00
7,	312	H. M. Park	22 50
8,	313	J. B. Hinchman	8 75
8,	314	Moving office	3 00
24,	321	Furniture	6 25
29,	336	Salary	83 33
30,	340	Moving office	3 00
Nov. 4,	343	J. B. Hinchman	36 25
14,	348	Stationery	13 00
30,	358	Salary	83 33
Dec. 30,	358	Salary	$83 37
27,	359	Stamps	6 00
Jan. 13,	371	Rent	50 00
		Total	$2,106 12

Expenses—Treasurer's Office.

Date.	No. of Order.		Total.
Sep. 21,	175	John Young	$10 50
21,	176	R. Bradshaw	10 00
21,	198	A. J. Dean	10 50
24,	210	F. C. Seitz	10 00
23,	229	Board of clerks	74 00
23,	257	Clerk hire	199 70
23,	253	A. J. Dean	39 56
25,	287	A. J. Dean	10 22
25,	...	A. J. Dean	57 25
		Total	$422 73

Printing.

Date.	No. of Order.		Total.
Feb. 28,	28	Michigan Farmer	$7 50
Jun. 10,	78	Post and Tribune	52 50
July 1,	99	Michigan Farmer	19 80
Aug. 1,	125	O. S. Gulley	8 00
1,	132	Times & Expositor	319 05
29,	157	Michigan Farmer	78 25
Sep. 21,	193	Post and Tribune	174 50
21,	194	E. B. Smith & Co	7 50
21,	195	Gulley & Co	79 00
Aug 20,	197	J. D. Walker, advertising	7 50
Sep. 23,	206	A. J. Dean	76 41
21,	244	Post and Tribune	5 50
19,	245	Post and Tribune	19 00
13,	246	Times & Expositor	48 50
24,	250	Detroit Free Press	49 00
24,	282	Detroit Free Press	4 00
Oct. 23,	319	Premium list	116 50
24,	335	Detroit Free Press	40 00
Jan. 8,	363	Times & Expositor	28 75
12,	370	Michigan Farmer	4 25
		Total	$145 51

Cost of Buildings.

Date.	No. of Order.		Total.
Feb. 16,	29	Plans and estimates	$20 00
Jun. 10,	75	Lumber	315 90
10,	76	"	81 51
18,	80	"	77 00
18,	83	Freight on lumber,	16 25
24,	84	" "	7 05
24,	88	Lumber	313 06
July 1,	90	"	198 40
1,	93	"	95 08
1,	96	Freight on lumber,	60 00
1,	97	Lumber	45 00
1,	98	Carpenter Work	33 62
1,	101	Lumber	193 28
1,	102	Carpenter work	96 73
24,	104	Lumber	150 41
24,	105	"	87 09
24,	106	Carpenter work	108 99
24,	107	Freight on lumber,	44 50
29,	108	Hauling lumber	25 00
29,	109	Boarding men	97 50

Date.	No. of Order.		Total.
July 29,	113	Lumber	$291 29
29,	116	Freight on lumber,	44 50
Aug. 1,	119	" "	70 25
July 21,	120	Lumber	125 68
30,	121	"	160 13
29,	122	"	87 00
31,	123	"	78 22
Aug. 3,	126	Carpenter work	203 54
12,	127	" "	459 19
6,	128	Lumber	83 60
3,	129	"	99 48
1,	130	"	86 68
1,	131	"	90 00
7,	133	"	1,254 15
10,	135	Freight on lumber,	125 00
9,	137	Lumber	123 05
2,	138	"	111 78
9,	139	"	94 08
3,	140	"	96 96
20,	141	Carpenter work	480 77
12,	142	Freight on lumber.	148 75
20,	143	Shingles	20 00
15,	144	Lumber	87 10
13,	145	"	182 45
14,	146	"	81 07
20,	149	"	72 00
20,	150	"	166 80
17,	151	"	100 96
19,	152	"	80 00
19,	153	"	275 20
19,	154	"	87 20
20,	155	"	167 27
26,	156	Carpenter work	497 39
27,	158	Lumber	36 00
Sep. 2,	159	Carpenter work	461 96
Aug 29,	160	Lumber	21 50
8,	162	"	184 80
22,	163	"	40 20
27,	164	"	90 00
23,	155	"	72 96
6,	167	"	112 73
Sep. 21,	185	Carpenter work	25 50
21,	204	Lumber	200 47
23,	205	Moving coops	22 00
7,	212	Lumber	304 25
2,	214	"	371 38
10,	215	Carpenter work	496 76
5,	216	Freight on lumber.	101 65
16,	222	Carpenter work	455 20
21,	234	Freight on lumber.	10 00
23,	240	Lumber	119 93
16,	290	Carpenters	60 75
24,	297	"	419 35
Oct. 8,	315	Lumber	184 32
24,	330	Coop rods	2 14
30,	339	Plastering cottage.	23 45
30,	341	Lumber	22 22
July 29,	112	Hardware, J. Welz,	28 30
Aug 10,	134	" Buhl & Co.	249 22
Sep. 23,	207	" "	193 37
24,	289	" J. Welz	115 30
Aug 20,	166	C. Comstock	40 05
Sep. 17,	183	Painting	27 73
20,	291	Sash and glass	46 57
Sep. 20,	292	Glass	$118 92
21,	294	Paint and oil	34 27
		Total	$12,897 13

General Expenses, Hotel Board, Etc.

Date.	No. of Order.		Total.
Jun. 10,	77	Changing seal	$1 50
Sep. 24,	224	Cheques	19 00
21,	225	Horace Turner	15 00
21,	230	Dewey & Swan	66 35
23,	239	F. Wetmore & Co.	1 88
13,	247	G. F. Case	4 50
9,	270	J. P. Thompson, charity	1 00
24,	284	W. Bodden & Co.	144 66
21,	300	J. M. Sterling	51 20
25,	302	Russell House	750 65
26,	203	D. H. Stone	3 95
Oct. 8,	317	Ladies wait'g room	15 00
24,	325	Sawdust	28 00
24,	326	Board of men	36 25
24,	327	Clearing gr'nds, etc.	159 16
24,	328	Lamps, oil, etc	5 75
24,	331	Renting and coll. booths	100 00
30,	242	Care of grounds	30 00
Nov. 9,	345	Posting bills	1 20
Dec. 9,	351	J. Weltz	16 53
9,	354	Care of grounds	30 50
Sep. 19,	180	Telegraph	50
17,	182	"	1 13
26,	192	"	93
Dec. 31,	361	Care of grounds	30 00
Jan. 13,	366	Messrs. Mayhew	25 00
13,	372	J. M. Sterling & Son	5 00
		Total	$1,494 64

Fence and Grounds and Water.

Date.	No. of Order.		Total.
May 10,	42	Sewer work	$89 78
10,	43	Oats for sowing	5 82
10,	44	" "	10 43
10,	45	Drag and cartage	10 00
10,	46	Tile	60 00
10,	47	Sewer connection	1 00
10,	48	Labor	90 25
10,	49	Stationery	2 09
10,	50	"	3 60
10,	51	Nails for fence	5 80
10,	53	" "	31 85
17,	54	A. J. Dean	7 75
17,	55	Plowing	20 62
17,	56	Sewerage	31 50
17,	57	Labor	49 50
17,	58	Plowing	12 38
17,	59	Freight on tile	15 80
17,	60	Sewerage	50 50
17,	61	Labor	38 50
31,	64	Road scraper	10 25
31,	65	Labor	60 00
31,	66	Board of men	52 00
31,	67	Exp. of Bus. Com.	18 00
31,	68	Labor	64 50

Date.	No. of Order.		Total.
Jun. 10,	70	Freight on nails	$3 00
10,	71	Labor	54 00
10,	72	Tile	11 00
10,	73	Freight on lumber	11 00
10,	74	Lumber for fence	176 36
10,	79	Labor	54 00
18,	81	Tile	34 59
18,	82	Lumber	58 00
24,	85	Labor	70 38
24,	87	Board of men	10 00
July 1,	91	Labor	61 87
1,	92	Labor	84 25
1,	100	Post and boards	61 63
1,	103	Hardware	11 09
29,	110	Labor	108 81
29,	115	Labor	53 90
Aug 22,	147	Gravel	8 20
16,	148	Surveying map	21 50
16,	161	Harvesting oats	23 84
Sep. 23,	242	J S Wormer & Sons	10 68
23,	296	C. S. Jennings	10 00
Oct. 10,	316	W. S. Penfield	45 39
24,	329	Brick	8 80
Jun. 24,	86	B'd of Water Com.,	62 50
July 1,	94	Water logs	60 00
31,	124	Water Com	28 70
Sep. 21,	298	M'nroe Gaslight Co	184 19
		Total	$2,079 61

Summary Statement.

The State Pomological Society,	$1,800 00
Expenses of law suit	10 30
Forage	1,180 23
Locating Committee	105 70
Exp's of Executive Committee	516 85
Ribbons and badges	39 85
Police at gates	440 25
Yellow fever sufferers	500 00
Right of way	50 00
Use of land outside fair grounds	100 00
Music	68 00
Power and shafting	976 00
Livery	52 00
Freight and switching	670 34
Meal tickets	471 69
Decorations and banners	110 37
Medals and diplomas	443 95
Expenses of winter meetings	363 98
Supt's assistants	215 65
Secretary's office	2,106 12
Treasurer's office	442 73
Printing	1,145 51
Buildings	12,897 13
General expenses	1,494 64
Fence, grounds and water	2,079 61
Grand total	$28,197 70

Money received by Business Committee and paid over to the Treasurer for Booth Rent.

	Lease.	Ft.	
Aug.			
20, W. H. Dewey	1	20	$75 00
20, W. Bodden & Co	2	20	60 00
20, Smith & Gettes	3	20	80 00
20, F. Saunders	4	20	80 00
26, Morrison & Hall	5	10	$40 00
20, M. Martz	6	20	60 00
20, John Airhart	7	20	80 00
20, John F. O'Neil	8	4	16 00
20, W. H. Brearly	9	20	80 00
20, C. M. Brush	10	6	24 00
20, Burton, Rhodes & Co	11	16	48 00
20, Baker & Gardner	12	16	64 00
20, A. Grant	13	10	40 00
22, F. Toeson	14	20	80 00
26, Jas. Deadman	15	10	30 00
26, W. H. Dewey	16	5	20 00
26, D. Cole	17	15	45 00
26, John Airhart	18	8	32 00
26, C. Wheeler	19	25	75 00
26, Jas. Owen & Co	20	50	150 00
26, A. Corder	21	8	24 00
26, Coopman & Hitchens	22	15	45 00
27, Frank Inglish	23	10	30 00
27, S. M. Shaffer	24	9	27 00
27, C. Blumeneau	25	10	40 00
25, E. G. Patterage	26	10	40 00
29, Mary Brenan	27	12	36 00
29, H. Boettsher	28	20	80 00
31, S. W. Smith	29	10	40 00
31, H. Goodenough	30	22	80 00
Sept.			
2, W. H. Prittie	31	30	120 00
2, P. G. Marten	32	6	18 00
2, E. Wood	33	12	36 00
2, C. A. Brush	34	2	8 00
3, T. S. Keith	35	6	24 00
3, Hull Bros	36	20	60 00
4, A. Palmer & Son	37	10	25 00
4, Higgins & Poland	38	10	30 00
5, Kean & Button	39	10	30 00
5, J. Hayden	40	10	30 00
5, Bates & Hawley	41	8	32 00
5, Jas. Hogan	42	5	15 00
6, P. Milligan	43	24	105 00
6, J. Carsalo	44	5	24 00
6, D. B. Harrington & Co.,	45	14	42 00
6, G. Albert Roth	46	14	56 00
6, E. A. Mulliken	47	10	30 00
6, C. R. Baker	48	8	24 00
6, Harmon & Smith	49	10	40 00
6, J. W. Wharf	50	15	45 00
9, John Vhay	51	16	48 00
9, Geo. Ricket	52	15	45 00
9, Russell & Bro	53	12	36 00
9, Geo. Grant	54	6	18 00
10, C. R. Seeley	55	7	21 00
10, G. E. Curtis & Co	56	12	36 00
11, Geo. F. Thompson	57	12	36 00
11, A. Schwanebeck	58	12	36 00
13, Jno. Gallagher & Co	59	12	36 00
12, F. Knorr & Co	60	14	42 00
13, German & Wilson	61	10	30 00
14, F. O. Kerber, swing	62	..	25 00
14, Seth Gilland	63	8	24 00
14, W. F. King, swing	64	..	25 00
14, W. B. Walkers, swing	65	..	25 00
14, C. Verchover, balloon	66	..	15 00
16, Lawrence, Dunn & Co	67	5	10 00
16, P. A. Crumborn	68	4	12 00

Sept.		Lease.	Ft.	
16, Smith & Gettes, privilege of selling on grand stand		69	..	$20 00
16, J. P. Johnson, swing		70	..	25 00
16, A. Miller, swing		71	..	25 00
16, H. W. Maine		72	2	6 00
16, F. J. Burr		73	6	18 00
16, Wm. M. Angel		74	3½	10 00
16, Parsons & Grand		75	2	6 00
16, Alfred Davis		76	5	15 00
16, J. F. Moxley		77	3½	10 00
16, M. E. Bartlett		78	5	14 00
11, L. D. Canfield, cider and nuts		79	..	8 00
17, J. C. Gordon, swing		80	..	20 00
17, Dr. Snyder		81	12	24 00
17, Webber & Co, base ball		82	..	15 00
17, N. Brown, fruit		83	..	10 00
17, J. Mittenthall, fruit		84	..	15 00
17, E. W. Wiggins, Punch & Judy		85	..	125 00
18, O. F. Pickard		86	..	10 00
18, S. W. Burlay		87	3	10 00
18, A. Stone		88	2	8 00
18, Julia Shaw		89	4	10 00
19, W. Frankenstein, grand stand		90	..	10 00
Total				$3,355 00
Less not collected of Davis				1 50
				$3,357 50

Amount Paid to Treasurer.

Aug.	21, Paid A. J. Dean	$325 50
	24,	80 00
	26,	194 50
	27,	38 50
	30,	112 00
Sept.	2,	179 00
	10,	358 50
	11,	72 50
	15,	69 00
	17,	189 00
	23,	1,637 25
	26,	99 75
	Total	$3,355 50

Permits to Peddlers.

Sept.	
18 to 24, Frank Roe, birds	$3 00
18 to 24, G. Royce, whips	10 00
18 to 24, Mrs. Kelley, fruit	1 00
18 to 24, Gippard, apples	4 00
18 to 24, Albran, fruit	1 00
18 to 24, O. F. Packard, blacking	10 00
18 to 24, Mason & Co., handkerchiefs and whips	6 00
18 to 24, W. W. Wetherby, candy	5 00
18 to 24, A. & J. Stanley, whips,	10 00
18 to 24, J. M. Stetson, cigars	10 00
18 to 24, Mrs. Lyon, fruit	10 00
18 to 24, C. & W. Van Deusen	10 00
18 to 24, Ferguson, candy	14 00
18 to 24, C. Dunn, candy	5 00
18 to 24, Chas. Butler, refreshments	$10 00
18 to 24, Chas Butler, swing	10 00
18 to 24, Baker, gum	5 00
18 to 24, Mann & Co	15 00
18 to 24, J. Stone, jeweler	2 00
18 to 24, O. Surtzer, fruit	5 00
18 to 24, W. Peters, melons	1 00
18 to 24, Unknown	1 50
Total	$148 50

For Mattresses.

Sep. 24. Mattresses sold	$4 50
Dec. 20, Paid A. J. Dean	4 50

For Grand Stand Collections.

Sep. 20, Collected by A. Navarre	3 00
Dec. 21, Paid A. J. Dean	3 00

For Kindling Wood.

Oct. 19, Sold by Wm. Bickford	22 94
19, Paid A. J. Dean	22 94

For Check Room.

1878.	
Sep. 24, Received of Grant	$39 30
Paid A. J. Dean	39 30

For Rebate on Lumber.

1878.			
Jun. 13,	Car No.	1075	$1 64
14,	"	2025	1 40
July 1,	"	1929, 1357	3 86
5,	"	235, 1029	1 77
9,	"	207	99
16,	"	103, 99	6 90
23,	"	309, 1295, 187	4 74
July 29,	"	1075, 91. 207, 2411	5 80
Aug. 6,	Car No.	2337, 1881, 27, 2025, 7592, 1596, 1605, 325, 1037	8 89
12,	Car No.	1059, 35, 1279, 2423, 127	9 44
23,	Car No.	139, 1777, 5577, 1161, 852, 99, 239, 199	7 01
24,	Car No.	2367, 175	3 62
29,	Car No.	1229, 267, 1491, 723, 1549, 33, 1083, 1897	15 37
Sep. 4,	Car No.	24, 106, 3618, 2233, 10593	7 88
Total			$87 76
Jan. 3, 1879.	Paid A. J. Dean		$87 76

Summary of Moneys received by Business Committee and paid over to Treasurer.

For Booth rent	$3,355 50
Pedlars' permits	148 50
Mattresses	4 50
Grand stand collections	3 00
Kindling wood	22 94
Check room	39 30
Rebate on lumber	87 76
Total	$3,661 50

Inventory of Property belonging to the Michigan State Agricultural Society in the City of Detroit.

	Feet.
1 Main building	68x304
1 Mechanic's wing to main b'ding	48x150
1 Art or south wing to main b'ding	48x 64
1 Agricultural annex main b'ding	24x 64
1 Pomological Octagon building	60x 60
1 Annex to Pomological Hall	24x 64
1 President and Secretary's office	20x 24
1 Police annex to office	12x 16
1 Ladies' cottage	16x 36
1 Treasurer's office	12x 16
1 Treasurer's office	12x 24
1 Carriage building	24x160
1 Implement building	24x200
1 Poultry house	20x 96
1 Check room	12x 16
1 Cattle Ampitheatre	80x 80
1 Judges' stand	14x 14
Material for grand stand	20x180
1 Marshal's barn	24x 32
424 Single cattle stalls	5 ft. 4 in.x 12
13 Bull stalls	8x 12
263 Single horse stalls	5 ft. 4 in.x 12
100 Box stalls	8x 12
360 Sheep and swine pens	5 ft. 4 in.x 17
1 railroad platform and cattle shoot	16x 40

The above buildings, including about 50,000 feet on hand, piled up on the ground, contain 833,598 feet of lumber and 346,750 shingles, and have cost $12,897 13.

1 Land roller	$35 00
1 Drag	10 00
1 Track scraper and grate	10 25
1,000 ft. 3 in. water logs	150 00
1,654 ft. wr'ght iron water pipe and fittings; 11 float valves, 9½ in. brass bibs, 3½ in. brass cocks; cost, includ'g plumber's bill	184 19
Taken up and in main building, 400 ft. 2 in. iron shaft'g, couplings and bearings for field power (in main build'g covered with a coat'g of tallow)	190 00
3 Fish aquariums (in bad order) are in main building.	
2 Hhds. of glass jars for exhibition of cereals; 1 axe; 1 hand saw.	
3 Hammers; 1 post auger.	
1 Carpenter's square.	
2 Large sprinkling pots.	
1½ doz. pair strap hinges.	
1 doz. tin cups.	
1 Box of department banners.	
1 National flag.	
3 Straw mattresses.	
3 Cotton comforters.	
1 doz. wooden rakes.	
1 Iron rake	
290 Poultry cups	
190 Poultry cups—coop fronts lost in 1877	$42 00
7 Iron ticket boxes	
1 Stove and pipe in ladies' waiting room, new	16 53
1 Shovel	
4 Lanterns	
6½ Kegs of nails	
1 Looking glass	
9 Padlocks	
1 3-in. water gate in Holden road	10 00
4 Kerosene lamps	
6 Hasps, hooks and staples	
9 Water tanks, 14x16 in. by 8 ft	
2 Water tanks, 14x16 in. by 14 ft	
2 Pump tanks, 2x2 ft. by 4 ft	
1 Large kerosene oil can	
1 Small kerosene oil can	
1 key to water gate	
1 key to shafting	
1 Iron pulley for shafting	
1 Tin pail	
1 Clock	3 00
1 Secretary table	35 00
1 Map of grounds, framed & glazed	21 50
1 Iron pulley	

J. M. STERLING,
A. O. HYDE,
W. L. WEBBER,
Business Committee.

REPORT OF COMMITTEE OF FINANCE ON ACCOUNTS OF BUSINESS COMMITTEE.

The undersigned Finance Committee of the Michigan State Agricultural Society beg leave to report that they have examined the foregoing records of accounts and transactions of the Business Committee of said Society, and have compared the vouchers in the hands of the Secretary and find the record to agree and the account correct, and in addition that we have examined the report of said committee of the amount received for rent of booths, pedlars' permits and property sold on the fair grounds at the last annual fair of said Society, and the name of the parties from whom received and the amount thereof, and we further certify that they have paid the same to the Treasurer and hold his receipt therefor, and for which he has rendered an account, and that we find the statements, vouchers, accounts and receipts correct in all respects.

All of which is respectfully submitted.

HENRY FRALICK,
F. V. SMITH,
E. W. RISING,
Finance Committee.

DETROIT, January 13, 1879.

TREASURER'S REPORT.

JANUARY 14, 1879.

1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.
Jan. 8,	1..	$400 00	May 17,	56..	$30 50	July 31,	111..	$22 00	Sept. 4,	166..	$40 05
	2..	14 28		57..	49 50		112..	28 30		167..	112 73
	3..	5 25	18,	58..	12 38		113..	291 29	5,	168..	121 37
	4..	10 30		59..	15 80		114..	83 33	20,	169..	25 00
11,	5..	6 00		60..	50 50	Aug. 2,	115..	53 90		170..	300 00
	6..	7 55		61..	58 50		116..	44 50		171..	8 50
	7..	7 00	June 1,	62..	83 33		117..	15 50	24,	172..	14 19
	8..	4 95	May 31,	63..	19 70	27,	118..	300 00		173..	3 00
	9..	5 05		64..	10 25	Sept. 4,	119..	70 25		174..	105 00
	10..	7 70		65..	60 00		120..	125 68		175..	10 50
	11..	5 50		66..	52 00		121..	160 13		176..	10 00
	12..	6 55		67..	18 00		122..	87 00		177..	16 35
	13..	2 50		68..	64 50		123..	78 22		178..	9 00
	14..	3 15	June 3,	69..	15 75		124..	28 70		179..	9 00
	15..	10 80	10,	70..	3 00		125..	8 00		180..	50
	16..	17 10		71..	54 00		126..	203 54		181..	17 30
	17..	3 00		72..	11 00		127..	459 19		182..	1 13
	18..	5 80		73..	11 00		128..	83 60		183..	27 73
	19..	4 00		74..	176 36		129..	99 48		184..	21 85
	20..	7 10	13,	75..	315 90		130..	86 68		185..	25 50
	21..	234 40		76..	81 51		131..	90 00		186..	114 33
16,	22..	6 15		77..	1 50		132..	319 05		187..	915 00
	23..	19 35		78..	52 50		133..	1254 15		188..	7 00
	24..	3 13		79..	54 00		134..	249 22		189..	7 00
15,	25..	17 33		80..	77 00		135..	125 00		190..	6 30
31,	26..	83 33		81..	34 49		136..	24 50		191..	8 60
Feb. 12,	27..	3 00	18,	82..	48 00		137..	123 05		192..	93
	28..	7 50		83..	16 25		138..	111 75		193..	174 50
16,	29..	20 00	24,	84..	7 05		139..	94 08		194..	7 50
	30..	19 75		85..	70 38		140..	96 96		195..	79 00
25,	31..	300 00		86..	62 50		141..	480 77		196..	24 00
28,	32..	83 33		87..	10 00		142..	148 75		197..	7 50
Mar. 15,	33..	67 50		88..	313 06		143..	20 00		198..	10 50
31,	34..	83 33	July 1,	89..	83 33		144..	87 10		199..	9 85
Apr. 12,	35..	12 00		90..	198 40		145..	182 45		200..	6 40
	36..	19 90		91..	61 87		146..	81 07		201..	12 55
	37..	11 00		92..	84 25		147..	8 20		202..	14 50
	38..	7 00	5,	93..	95 08		148..	21 50		203..	28 75
	39..	8 35		94..	60 00		149..	72 00		204..	200 47
May 1,	40..	83 33		95..	28 50		150..	166 80		205..	22 00
	41..	11 50		96..	60 00		151..	100 96		206..	76 41
10,	42..	89 78	10.	97..	45 00		152..	80 00		207..	193 37
	43..	5 82		98..	33 62		153..	275 20		208..	65 00
	44..	10 43	11,	99..	19 80		154..	87 20		209..	16 10
	45..	10 00	17,	100..	61 63		155..	167 27		210..	10 00
	46..	66 00		161..	193 28		156..	497 39		211..	500 00
	47..	1 00		102..	96 73		157..	78 25		212..	304 25
	48..	90 25		103..	11 09		158..	36 00		213..	14 50
	49..	2 20	24,	104..	150 41		159..	461 96		214..	371 38
	50..	3 60		105..	87 09		160..	21 50		215..	496 76
	51..	5 80		106..	108 99		161..	23 84		216..	101 65
	52..	16 27		107..	44 50		162..	184 80		217..	50 00
	53..	31 85		108..	25 00		163..	46 20		218..	19 65
17,	54..	7 75		109..	97 50		164..	90 00		219..	10 75
	55..	20 62	31,	110..	108 81		165..	72 96		220..	73 90

TREASURER'S REPORT.—CONTINUED.

1878.	Orders.	Amount.
Sept. 24,	221..	$20 60
	222..	455 20
	223..	75 00
	224..	19 00
	225..	15 00
	226..	10 00
	227..	40 50
	228..	68 00
	229..	75 00
	230..	66 35
	231..	16 60
	232..	9 50
	233..	9 33
	234..	10 00
	235..	395 00
	236..	575 00
	237..	6 00
	238..	8 80
	239..	1 88
	240..	119 93
	241..	20 00
	242..	10 68
	243..	20 00
	244..	5 50
	245..	19 00
	246..	48 50
	247..	4 50
	248..	10 70
	249..	15 80
	250..	49 00
	251..	199 70
	252..	141 90
	253..	39 56
	254..	50 00
	255..	108 85
	256..	15 25
	257..	30 00
	258..	21 25
	259..	11 75
	260..	32 75
	261..	15 00
	262..	9 25
	263..	10 30
	264..	5 00
	265..	8 00
	266..	8 00
	267..	5 50
	268..	50
	269..	8 00
	270..	1 00
	271..	13 75
	272..	13 75
	273..	16 25
	274..	17 50
	275..	16 00
	276..	12 50
	277..	10 75
	278..	12 50
	279..	14 25
	280..	15 25
	281..	33 00
	282..	4 00

1878.	Orders.	Amount.
Sept. 24,	283..	$16 80
	284..	144 66
	285..	52 00
	286..	23 50
25,	287..	10 22
	288..	25 00
	289..	115 30
	290..	60 75
	291..	46 57
	292..	118 92
	293..	1 82
	294..	34 27
	295..	4 00
	296..	10 00
	297..	419 35
	298..	184 19
	299..	213 25
	300..	51 20
	301..	471 69
	302..	700 65
	303..	3 95
	304..	58 30
	305..	15 00
Oct. 2,	306..	83 33
7,	307..	12 00
	308..	89 74
	309..	1 01
	310..	60 00
	311..	17 50
	312..	22 50
8,	313..	8 75
	314..	3 00
20,	315..	184 32
	316..	45 39
	317..	15 00
	318..	79 91
23,	319..	116 50
24,	320..	8 75
	321..	6 25
	322..	3 40
	323..	18 31
	324..	5 52
	325..	28 00
	326..	36 25
	327..	159 16
	328..	5 75
	329..	8 80
	330..	2 14
	331..	100 00
	332..	17 00
	333..	3 85
	334..	343 00
	335..	40 00
29,	336..	83 33
	337..	289 45
	338..	30 00
30,	339..	23 45
	340..	3 00
	341..	22 22
	342..	30 00
Nov. 4,	343..	36 25
	344..	300 00

1878.	Orders.	Amount.
Nov. 9,	345..	$1 20
	346..	26 68
	347..	17 30
14,	348..	13 00
25,	349..	15 00
30,	350..	83 33
Dec. 9,	351..	16 53
	352..	25 00
	353..	13 05
	354..	30 50
	355..	200 00
	356..	......
	357..	......
Jan. 2,	358..	83 37
	359..	6 00
	360..	47 00
	361..	30 00
6,	362..	68 00
8,	363..	28 75
13,	364..	57 25
	365..	15 00
	366..	25 00
	367..	19 00
	368..	38 00
	369..	200 00
	370..	4 25
	371..	50 00
	372..	5 00
	373..	9 50
	374..	12 92
Cor. Total		$28,197 70

Old Premiums, Checks Paid.

1877.	Orders.	Amount.
Oct. 2,	308..	$2 00
	360..	1 00
	391..	4 00
Sept. 24,	178..	10 00
Oct. 2,	310..	2 00
	408..	2 00
16, Pom'l.	43..	2 00
Sept. 25,	244..	3 00
Oct. 7,	357..	1 00
1878.		
Jan. 10. N. Series.		
	1..	10 00
	2..	10 00
	3..	10 00
	4..	25 00
	5..	25 00
	6..	25 00
	7..	50 00

Premium Checks (New Series) for 1878, Paid.

1878.	Orders.	Amount.
	1..	......
Sept. 20.	2..	$13 00

1878.	Orders.	Amount.
Sept. 20,	3..	$83 00
	4..	54 00
	5..	15 00
	6..	45 00
	7..	25 00
	8..	30 00
	9..	25 00
	10..	50 00
Second.		
	10..	78 00
28,	11..	125 00
	12..	120 00
	13..	10 00
	14..	15 00
	15..	7 00
Second.		
	15..	15 00
	16..	5 00
	17..	10 00
	18..	23 00
	19..	10 00
	20..	107 00
	21..	15 00
	22..	110 00
	23..	25 00
	24..	27 00
	25..	8 00
	26..	35 00
	27..	25 00
	28..	20 00
	29..	15 00
	30..	42 00
	31..	5 00
	32..	85 00
	33..	3 00
	34..	20 00
	35..	15 00
	36..	10 00
	37..	41 00
	38..	34 00
	39..	10 00
Sept. 21,	40..	60 00
	41..	131 00
	42..	8 00
	43..	20 00
	44..	109 00
	45..	20 00
	46..	13 00
	47..	28 00
	48..	20 00
	49..	35 00
	50..	3 00
	51..	107 00
	52..	99 00
	53..	25 00
	54..	83 00
	55..	8 00
	56..	......
	57..	156 00
	58..	90 00
	59..	20 00

TREASURER'S REPORT.—CONTINUED.

1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.
Sept. 21,	60..	$7 00	Sept. 25,	122..	$2 00	Sept. 26,	184..	$0 50	Sept. 21,	246..	$8 00
	61..	57 00		123..	----		185..	5 00		247..	15 00
	62..	37 00		124..	4 00		186..	1 00		248..	12 00
	63..	10 00		125..	75		187..	2 00		249..	2 00
	64..	3 00		126..	1 00		188..	50		250..	30 00
	65..	58 00		127..	2 50		189..	2 00		251..	125 00
	66..	36 00		128..	1 00		190..	8 00		252..	22 00
	67..	40 00		129..	6 00		191..	1 50		253..	10 00
	68..	206 00		130..	2 00		192..	50		254..	20 00
	69..	14 00		131..	10 00		193..	1 00		255..	30 00
	70..	14 00		132..	1 00		194..	2 00		256..	10 00
	71..	49 00		133..	4 00		195..	1 00		257..	20 00
	72..	13 00		134..	1 00		196..	4 00		258..	15 00
	73..	73 00		135..	5 00		197..	4 00		259..	10 00
	74..	35 00		136..	1 00		198..	1 00		260..	40 00
	75..	28 00		137..	2 00		199..	----		261..	2 00
	76..	15 00		138..	2 00	21,	200..	1 25		262..	10 00
	77..	20 00		139..	----		201..	75		263..	----
	78..	29 00		140..	5 00		202..	1 00		264..	2 00
	79..	50 00		141..	1 00		203..	75		265..	----
23,	80..	6 00		142..	3 00		204..	50		266..	10 00
	81..	15 00		143..	3 00		205..	50		267..	25 00
	82..	10 00		144..	3 00		206..	30		268..	30 00
	83..	4 00		145..	1 00		207..	20		269..	32 00
	84..	2 00		146..	14 50		208..	30		270..	10 00
	85..	8 00		147..	5 00		209..	25		271..	12 00
	86..	3 00		148..	2 00		210..	15		272..	8 00
	87..	2 00		149..	2 00		211..	1 00		273..	6 00
	88..	4 00		150..	3 00		212..	75		274..	14 00
	89..	6 00		151..	2 00		213..	50		275..	107 00
	90..	5 00		152..	1 00		214..	75		276..	5 00
	91..	3 00		153..	2 00		215..	1 00		277..	----
	92..	5 00		154..	3 00		216..	75		278..	10 00
	93..	8 00		155..	2 00		217..	2 00		279..	27 00
	94..	2 00		156..	2 00		218..	1 21		280..	5 00
	95..	10 00		157..	3 00		219..	75		281..	4 00
	96..	8 00		158..	1 00		220..	30		282..	8 00
	97..	2 00		159..	2 00		221..	30		283..	10 00
	98..	3 00	26,	160..	3 00		222..	25		284..	8 00
	99..	2 00		161..	1 00		223..	15		285..	14 00
	100..	1 00		162..	3 00		224..	30		286..	4 00
	101..	2 00		163..	1 00		225..	20		287..	5 00
	102..	6 00		164..	1 00		226..	10		288..	2 00
	103..	17 00		165..	2 00		227..	20		289..	30 00
	104..	3 00		166..	2 00		228..	12		290..	20 00
	105..	4 00		167..	1 00		229..	12		291..	10 00
	106..	2 00		168..	2 00		230..	8		292..	10 00
	107..	2 00		169..	2 00		231..	10		293..	15 00
	108..	1 00		170..	2 00		232..	7		294..	25 00
	109..	5 00		171..	15 00		233..	----		295..	20 00
	110..	5 00		172..	50		234..	30		296..	15 00
	111..	5 00		173..	1 00		235..	20		297..	10 00
	112..	6 50		174..	10 00		236..	10		298..	12 00
	113..	1 00		175..	15 00		237..	15		299..	8 00
	114..	2 00		176..	1 50		238..	97		300..	5 00
	115..	1 50		177..	3 00		239..	1 00		301..	30 00
	116..	3 00		178..	11 00		240..	10 00		302..	2 00
	117..	3 00		179..	4 00		241..	20 00		303..	18 00
	118..	3 00		180..	3 00		242..	12 00		304..	4 00
	119..	4 00		181..	1 00		243..	10 00		305..	20 00
25,	120..	2 00		182..	1 00		244..	8 00		306..	20 00
	121..	2 00		183..	5 00		245..	5 00		307..	10 00

TREASURER'S REPORT.—CONTINUED.

1878.	Orders.	Amount.
Sept. 21,	308 ..	$12 00
	309 ..	8 00
	310 ..	18 00
	311 ..	5 00
	312 ..	9 00
	313 ..	7 00
	314 ..	8 00
	315 ..	5 00
	316 ..	19 00
	317 ..	3 00
	318 ..	15 00
	319 ..	10 00
23,	320 ..	4 00
	321 ..	4 00
	322 ..	3 00
	323 ..	30 00
	324 ..	10 00
	325 ..	25 00
	326 ..	20 00
	327 ..	10 00
	328 ..	20 00
	329 ..	.....
Lost see 710 Dup.		
	330 ..	17 00
	331 ..	27 00
	332 ..	2 00
	333 ..	17 00
	334 ..	38 00
	335 ..	33 00
	336 ..	9 00
	337 ..	7 00
	338 ..	56 00
	339 ..	1 00
	340 ..	1 00
	341 ..	2 00
	342 ..	1 00
	343 ..	4 00
	344 ..	18 00
	345 ..	2 00
	346 ..	2 00
	347 ..	5 00
	348 ..	1 00
	349 ..	5 00
	350 ..	5 00
	351 ..	5 00
	352 ..	50 00
	353 ..	5 00
	354 ..	130 00
	355 ..	.....
	356 ..	17 00
	357 ..	3 00
	358 ..	24 00
	359 ..	71 00
24,	360 ..	9 00
	Second.	
	360 ..	158 00
	361 ..	.....
	362 ..	15 00
	363 ..	28 00
	364 ..	7 00
	365 ..	10 00

1878.	Orders.	Amount.
Sept. 24,	366 ..	$1 00
	367 ..	5 00
	368 ..	3 00
	369 ..	16 00
	370 ..	3 00
	371 ..	3 00
	372 ..	3 00
	373 ..	3 00
	374 ..	9 00
	375 ..	46 00
	376 ..	5 00
	377 ..	2 00
	378 ..	3 00
	379 ..	1 00
	380 ..	39 00
	381 ..	13 00
	382 ..	5 00
	383 ..	2 00
	384 ..	2 00
	385 ..	1 00
	386 ..	4 00
	387 ..	2 00
	388 ..	8 00
	389 ..	5 00
	390 ..	6 50
	391 ..	3 00
	392 ..	4 00
	393 ..	2 00
	394 ..	4 00
	395 ..	2 00
	396 ..	2 00
	397 ..	2 00
27,	398 ..	2 00
	399 ..	1 00
	400 ..	2 00
	401 ..	2 00
	402 ..	1 00
	403 ..	3 00
	404 ..	2 00
	405 ..	1 00
	406 ..	1 00
	407 ..	2 00
	408 ..	3 00
	409 ..	1 00
	410 ..	1 00
	411 ..	2 00
	412 ..	3 00
	413 ..	1 00
	414 ..	2 00
	415 ..	2 50
	416 ..	1 00
	417 ..	1 00
	418 ..	1 00
	419 ..	1 00
	420 ..	44 00
	421 ..	50 00
	422 ..	50
	423 ..	2 00
	424 ..	1 00
	425 ..	10 00
	426 ..	2 00

1878.	Orders.	Amount.
Sept. 27,	427 ..	.....
	428 ..	$2 00
	429 ..	2 00
	430 ..	63 00
	431 ..	1 00
	432 ..	1 00
	433 ..	5 00
	434 ..	3 00
	435 ..	1 50
	436 ..	1 00
	437 ..	1 00
28,	438 ..	1 00
	439 ..	1 00
	440 ..	17 00
	441 ..	15 00
	442 ..	1 00
	443 ..	5 00
	444 ..	1 00
	445 ..	5 00
	446 ..	5 00
	447 ..	60 00
	448 ..	1 00
	449 ..	2 00
	450 ..	1 00
	451 ..	1 00
	452 ..	1 00
	453 ..	50
	454 ..	15 00
	455 ..	15 00
	456 ..	3 00
	457 ..	3 00
	458 ..	1 00
	459 ..	5 00
	460 ..	2 00
	461 ..	43 00
	462 ..	5 00
	463 ..	4 00
	464 ..	.....
	465 ..	1 00
	466 ..	20 00
	467 ..	.....
	468 ..	20 00
	469 ..	1 00
	470 ..	58 50
	471 ..	3 00
	472 ..	1 00
	473 ..	60 00
	474 ..	25 00
	475 ..	5 00
	476 ..	15 00
	477 ..	5 00
	478 ..	5 00
	479 ..	1 00
	480 ..	3 00
	481 ..	2 00
	482 ..	7 00
	483 ..	1 00
	484 ..	5 00
	485 ..	1 00
	486 ..	2 00
	387 ..	10 00

1878.	Orders.	Amount.
Sept. 28,	488 ..	$38 00
	489 ..	2 00
	490 ..	2 00
	491 ..	4 00
	492 ..	50
	493 ..	2 00
	494 ..	1 00
	495 ..	25 00
	496 ..	15 00
	497 ..	12 00
	498 ..	21 00
	499 ..	3 00
	500 ..	2 00
	501 ..	5 00
	502 ..	5 00
	503 ..	34 00
	504 ..	1 00
	505 ..	10 00
	506 ..	5 00
	507 ..	8 00
	508 ..	5 00
	509 ..	3 00
	510 ..	2 00
	511 ..	2 00
	512 ..	2 00
	513 ..	2 00
	514 ..	3 00
	515 ..	4 00
	516 ..	1 00
	517 ..	3 00
30,	518 ..	2 00
	519 ..	5 00
	520 ..	2 00
	521 ..	10 00
	522 ..	5 00
	523 ..	2 00
	524 ..	5 00
	525 ..	3 00
	526 ..	2 00
	527 ..	6 00
	528 ..	2 00
	Second.	
	525 ..	5 00
	529 ..	3 00
	530 ..	3 00
	531 ..	2 00
	532 ..	3 00
	533 ..	2 00
	534 ..	5 00
	535 ..	4 00
	536 ..	3 00
	537 ..	3 00
	538 ..	5 00
	539 ..	10 00
	540 ..	15 00
	541 ..	3 00
	542 ..	3 00
	543 ..	20 00
	544 ..	6 00
	545 ..	8 00
	546 ..	1 00

TREASURER'S REPORT.—CONTINUED.

1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.
Sept. 30.	547..	$22 00	Oct. 23,	608..	$6 00	Oct. 3,	668..	$3 00	Sept. 20,	8..	$21 25
	548..	2 00		609..	3 00		669..	19 00		9..	45 00
	549..	2 00		610..	20 00		670..	5 00		10..	12 25
	550..	4 00		611..	3 00		671..	5 00		11..	4 25
	551..	15 00		612..	16 00		672..	3 00		12..	5 00
	552..	25 00		613..	5 00		673..	3 00		13..	14 25
	553..	6 50		614..	10 00		674..	3 00		14..	31 00
	554..	1 00	Lost, see	709 Dup.			675..	28 00		15..	4 00
	555..	21 00		615..	-----		676..	5 00		16..	1 50
	556..	34 00		616..	5 00	4,	677..	15 00		17..	1 00
Oct. 2,	557..	5 00		617..	7 00		678..	15 00		18..	23 75
	558..	10 00		618..	32 00		679..	2 00		19..	12 75
	559..	3 00		619..	2 00		680..	5 00		20..	22 00
	560..	1 00		620..	2 00		681..	2 00		21..	3 50
	561..	9 00		621..	1 00	Can'led	682..	-----		22..	1 75
	562..	6 00		622..	2 00		683..	8 00		23..	28 00
	563..	3 00		623..	15 00		684..	5 00		24..	22 25
	564..	2 00		624..	2 00		685..	3 00		25..	4 00
	565..	2 00		625..	4 00		686..	5 00		26..	5 75
	566..	5 00		626..	3 00		687..	3 00		27..	75
	567..	-----		627..	10 00		688..	5 00		28..	6 75
	568..	73 00		628..	18 00		689..	3 00		29..	5 00
	569..	41 00		629..	6 00		690..	5 00		30..	3 50
	570..	-----		630..	2 00		691..	12 00		31..	75
	571..	2 00		631..	12 00		692..	-----		32..	1 50
	572..	2 00		632..	2 00		693..	7 00		*Second.*	
	573..	3 00		633..	1 00		694..	2 00		32..	19 00
	574..	2 00		634..	6 00		695..	3 00		33..	8 00
	575..	3 00		635..	13 00		696..	4 50		34..	2 75
	576..	1 00		636..	3 00		697..	3 00		35..	15 00
	577..	5 00		637..	2 00		698..	1 00		36..	4 00
	578..	2 00		638..	8 00		699..	2 00		37..	75
	579..	10 00		639..	3 00		700..	2 00		38..	8 75
	580..	3 00		640..	19 00		701..	2 00		39..	3 00
	581..	16 00		641..	7 00		702..	----		40..	1 00
	582..	6 00		642..	4 00		703..	2 00		41..	9 25
	583..	19 00		643..	5 00		704..	2 00		42..	5 25
	584..	15 00		644..	10 00		705..	26 00		43..	----
	585..	8 00		645..	5 00		706..	----		44..	2 00
	586..	1 00		646..	5 00		707..	1 00		45..	5 00
	587..	47 00		647..	6 00		708..	5 00		46..	1 00
	588..	5 00		648..	6 00	(See 615.)				47..	1 00
	589..	3 00		649..	2 00		709..	2 00		48..	50
	590..	16 00		650..	14 00		710..	15 00		49..	3 00
	591..	3 00		651..	8 00		711..	2 00		50..	5 50
	592..	3 00		652..	1 00		712..	2 00		51..	1 00
	593..	7 00		653..	4 00		713..	2 00		52..	2 00
	594..	5 00		654..	2 00		714..	50		53..	18 00
	595..	5 00		655..	1 00		715..	25 00		54..	50
	596..	16 00		656..	5 00					55..	3 75
3,	597..	1 00		657..	1 00	Total	....	$10,357 25		56..	29 50
	598..	2 00		658..	2 00					57..	28 25
	599..	41 00		659..	2 00	*Pomological Premium Checks.*				58..	4 00
	600..	50 00		660..	7 00					59..	75
	601..	25 00		661..	1 00	Sept. 20,	1..	$80 25		60..	1 00
	602..	3 00		662..	2 00		2..	49 75		61..	1 00
	603..	8 00		663..	15 00		3..	56 50		62..	6 25
	604..	6 00		664..	9 50		4..	9 75		63..	3 75
	605..	3 00		665..	3 00		5..	58 00		64..	4 00
	606..	1 00		666..	5 00		6..	2 00		65..	50
	607..	12 00		667..	14 00		7..	11 75		66..	2 00

TREASURER'S REPORT.—Continued.

1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.	1878.	Orders.	Amount.
Sept. 20,	67..	$10 25	Sept. 20,	71..	$2 00	Sept. 20,	75..	$5 00	Sept. 20,	79..	$3 00
	68..	4 50		72..	1 00		76..	5 00		80..	5 00
	69..	1 00		73..	5 00		77..	10 00	Oct. 23,	81..	....
	70..	5 00		74..	3 00		78..	5 00		82..	1 00
Total......................										....	$816 25

CASH.

1878.		Dr.
Oct. 9	To J. P. Thompson, Secretary, for 60 whole tickets returned......	$30 00
13	To Wayne County Savings Bank on Canada Coll..................	1 50
	Admission tickets from Russell House.........	151 00
	33 G. T. R'y tickets, coupons, payment refused	16 50
	Old premium checks....	182 00
	Business orders.........	28,197 70
	Premium checks.........	10,357 25
	Pomological checks....	816 25
Jan. 14	Cash to balance on hand	19,027 91
		$58,780 11

		Cr.
Jan. 7	Cash on hand	$9,639 62
Sept. 7	Citizens' Subscription, Detroit................	10,000 00
	Memb'rship certificates	1,157 00
	Gate receipts...........	33,761 15
	J. M. Sterling, booth rent.................	3,355 50

1878.		Cr.
	J. M. Sterling, pedlars' licenses................	148 50
	Kindling wood, etc.....	22 74
	Rebate E. B. Smith....	7 00
	J. M. Sterling, sale mattresses................	4 50
	J. M. Sterling, money collected on the grand stand by Navare.....	3 00
	J. M. Sterling, cash from check room	39 30
1879.		
Jan. 7	J. M. Sterling, rebate on lumber, account.......	87 76
	Returned by E. O. Humphrey, President.....	500 00
	W. L. Wedber on account of Saginaw D. Park	$53 84
		$58,780 11

A. J. DEAN,
Treasurer Mich. State Ag. Society.

Detroit, January 14, 1879.

REPORT OF FINANCE COMMITTEE ON TREASURER'S REPORT.

To the President and Executive Committee of the Michigan State Agricultural Society:

The undersigned, your Finance Committee, to whom was referred the foregoing account of the Treasurer of said Society, respectfully report that we have compared said account with the vouchers accompanying the same, and the stubs with the checks, and find them to agree, and the accounts correct; and we further report that we have examined the Treasurer's ticket account hereto annexed, and find that satisfactory and correct, and we recommend the various tickets now remaining on hand, viz.: 17,003 whole tickets, 4,665 children's tickets, and 2,250 grand stand tickets, in all 23,918, be destroyed.

All of which is respectfully submitted.

HENRY FRALICK,
E. W. RISING,
F. V. SMITH,
Finance Committee.

Detroit, January 13, 1879.

Sept. 16, 17, 18, 19, and 20, 1878.

Received whole tickets	80,000	
Returned whole tickets	17,003	
	62,997 sold 50c	$31,498 50
Received children's tickets	10,000	
Returned children's tickets	5,335	
	4,665 sold 25c	1,166 25
Received Grand Stand tickets	10,000	
Returned Grand Stand tickets	7,750	
	2,250 sold 25c	562 50
Tickets sold Detroit school children, 2,892 at 10c		289 20
Tickets sold A. Bartlett, Superintendent Windsor school, 297 at 10c		29 70
Received from M. I. Mills per Michigan Stove Works		200 00
Received from W. R. Clark, do. 60 employés		15 00
		$33,761 15

Exhibit Sale of Membership Certificates, 1878.

2,314 Membership certificates sold at $1.00 each	$2,314
Less 2,314 Admission tickets included with them at 50c	1,157
	$1,157

All of which is respectfully submitted.

J. M. STERLING,
A. O. HYDE,
W. L. WEBBER,
Business Committee.

LIST OF PREMIUMS AWARDED, 1878.

DIVISION A.

CLASS 1.—SHORTHORNS.

Bulls.

Bulls four years or over—Charles Lincoln, Lewisburg, Ohio, 1st premium	$25 00
Mazurka Prince, D. M. Uhl, Ypsilanti, Mich., 2d premium	20 00
Comet, A. P. Cook, Brooklyn, Mich., 3d premium	15 00
Lord York, 2d, F. A. Beard, Ruby, Mich., 4th premium	10 00
Bull three years old—Joe Johnston, 5th, R. C. Remick, Detroit, 1st premium,	20 00
Red Prince, A. S. Brooks, West Novi, Mich., 2d premium	15 00
Plumwood Lad, James Moore, Milford, Mich., 3d premium	10 00
Treble Mazurka, Alex. McPherson, Howell, Mich., 4th premium	5 00
Bull two years old—David Miller, Clarkston, Mich, 1st premium	20 00
D. S. Holcomb, Jackson, Mich., 2d premium	15 00
Avery & Murphy, Detroit, Mich., 3d premium	10 00
L. L. Brooks, Novi, Mich., 4th premium	5 00
Bull one year old—Chas. Lincoln, Lewisburgh, Ohio, 1st premium	15 00
Wm. Ball, Hamburgh, Mich., 2d premium	10 00
Earl of Mason, Amos F. Wood, Mason, Mich., 3d premium	5 00
D. S. Holcomb, Jackson, Mich., 4th premium	3 00
Bull Calf—Hard Times, C. Whittaker, Chelsea, Mich., 1st premium	12 00
Hannibal, C. Whittaker, Chelsea, Mich., 2d premium	8 00
Young Stewart, B. W. & H. F. Phelps, Dexter, Mich., 3d premium	5 00
William Smith, Detroit, Mich., 4th premium	3 00
Best Bull of any age—Chas. Lincoln, Lewisburgh, Ohio	Diploma

Cows.

Cows four years old or over—R. G. Dun, London, Ohio, 1st premium	$25 00
R. G. Dun, London, Ohio, 2d premium	20 00
Fall Beauty, Amos F. Wood, Mason, Mich., 3d premium	15 00
Chas. Lincoln, Lewisburgh, Ohio	10 00
Heifers three years old—D. S. Holcomb, Jackson, Mich., 1st premium	20 00
Chas. Lincoln, Lewisburgh, Ohio, 2d premium	15 00
Lady Stewart, B. W. & H. F. Phelps, Dexter, Mich., 2d premium	10 00
Gipsey, 2d, W. & F. Warner, Dexter, Mich., 4th premium	5 00
Heifers two years old—Mild Eyed Vinewood, Avery & Murphy, Detroit, Mich., 1st premium	20 00
Berlinda 2d, Avery & Murphy, Detroit, Mich., 2d premium	15 00
Chas. Lincoln, North Lewisburgh, Ohio, 3d premium	10 00
D. M. Uhl, Ypsilanti, Mich., 4th premium	5 00
Yearling Heifer—Royal Duchess 5th, Avery & Murphy, Detroit, Mich., 1st premium	15 00
Queen Esther, Avery & Murphy, Detroit, Mich., 2d premium	10 00
R. G. Dun, London, Ohio, 3d premium	5 00
Alex. McPherson, Howell, Mich., 4th premium	3 00
Heifer Calf—Alex. McPherson, Howell, Mich., 1st premium	12 00
R. G. Dun, London, Ohio, 2d premium	8 00
Webster Beauty, 4th, B. W. & H. F. Phelps, Dexter, Mich., 3d premium	5 00
M. I. Mills, Detroit, Mich., 4th premium	3 00
Bull with four of his get showing best breeding qualities—Chas. Lincoln, North Lewisburgh, Ohio	20 00
Cow and three of her progeny, showing best breeding qualities—B. W. & A. F. Phelps, Dexter, Mich.	20 00

CLASS 2.—DEVONS.

Bulls.

Bull four years old or over—Candy, 777, B. F. Peck, East Bethany, N. Y., 1st premium	$25 00
Victor, E. T. Doney, Jackson, Mich., 2d premium	20 00
Bull two years old—Redro, H. W. Runyan, Disco, Mich., 1st premium	15 00
Bull one year old—Flitten 2d, A. J. Burrows, Troy, Mich., 1st premium	10 00
Bull Calf—Flitten 7th, B. F. Peck, East Bethany, N. Y., 1st premium	7 00
Flitten 8th, B. F. Peck, East Bethany, N. Y., 2d premium	5 00

Cows.

Cow four years old or over—Victoria 2d, B. F. Peck, East Bethany, N. Y., 1st premium	$25 00
Dora 2d, H. D. Runyan, Disco, Mich., 2d premium	20 00
Lucy 2d, A. J. Burrows, Troy, Mich., 3d premium	10 00
Heifer three years old—Victoria 4th, B. F. Peck, East Bethany, N. Y., 1st premium	20 00
Candy Girl 4th, B. F. Peck, East Bethany, N. Y., 2d premium	12 00
Lena, H. D. Runyan, Disco, Mich., 3d premium	8 00
Heifer two years old—Victoria 5th, B. F. Peck, East Bethany, N. Y., 1st premium	15 00
Candy Girl 5th, B. F. Peck, East Bethany, N. Y., 2d premium	10 00
Heifer one year old—Maude, A. J. Burrows, Troy, Mich., 1st premium	10 00
Helena 7th, B. F. Peck, East Bethany, N. Y., 2d premium	5 00
Annie, A. J. Burrows, Troy, Mich., 3d premium	3 00
Heifer calf—Candy Girl 7th, B. F. Peck, East Bethany, N. Y., 1st premium	7 00
Mabel, H. W. Runyan, Disco, Mich., 2d premium	5 00

CLASS 3.—HEREFORDS.

Bulls.

Bull Calf—Hero, Edwin Phelps, Pontiac, Mich., 1st premium	$7 00
Bodie, Edwin Phelps, Pontiac, Mich., 2d premium	5 00
Cow four years old or over—2d Michigan Rose, Edwin Phelps, Pontiac, Mich., 1st premium	25 00
First Michigan Rose, Edwin Phelps, Pontiac, Mich., 2d premium	20 00
Heifer three years old—4th Michigan Rose, Edwin Phelps, Pontiac Mich., 1st premium	20 00

Heifer two years old—Michigan Rose 5th, Edwin Phelps, Pontiac, Mich., 1st premium	$15 00
Heifer one year old—Michigan Rose 6th, Edwin Phelps, Pontiac, Mich., 1st premium	10 00
Heifer Calf—Cora 8th, Edwin Phelps, Pontiac, Mich., 1st premium	7 00

Holstein Bulls.

Two years old—Johnson & Richardson, Tuscola, Mich., 1st premium	$15 00
Four years old—W. K. Green, Adrian, Mich., 1st premium	25 00
Heifer three years old—Johnson & Richardson, Tuscola, Mich., 1st premium	20 00
Heifer one year old—Johnson & Richardson, Tuscola, Mich., 1st premium	10 00
Best Bull of any age—W. K. Gree, Adrian, Mich.	Diploma

CLASS 4.—AYRSHIRES.

Bulls.

Bull four years old—Loraine, A. J. Wilson, LaPorte, Ohio, 1st premium	$25 00
Bull one year old—James Wilson, A. J. Wilson, LaPorte, Ohio, 1st premium,	10 00
Bull Calf—American Hero, A. J. Wilson, LaPorte, Ohio, 1st premium	7 00
Loraine 2d, A. J. Wilson, LaPorte, Ohio, 2d premium	5 00
Best Bull of any age—Loraine, A. J. Wilson, LaPorte, Ohio	Diploma

Cows.

Cow four years old or over—Annie, A. J. Wilson, LaPorte, Ohio, 1st premium,	$25 00
Walter Pixley, Hudson, Mich., 2d premium	20 00
Nonesuch, A. J. Wilson, LaPorte, Ohio, 3d premium	10 00
Cow three years old—Miss Leisser, A. J. Wilson, LaPorte, Ohio, 1st premium,	20 00
Snow Drop, A. J. Wilson, LaPorte, Ohio, 2d premium	12 00
Cow two years old—Walter Pixley, Hudson, Mich., 1st premium	15 00
Dairy, R. B. Caruss, St. Johns, Mich., 2d premium	10 00
Heifer one year old—Red Rose of Canada, A. J. Wilson, LaPorte, Ohio, 1st premium	10 00
Heifer calf—Rose Loraine, A. J. Wilson, LaPorte, Ohio, 1st premium	7 00

CLASS 5.—JERSEYS.

Bulls.

Bull four years old and over—Wright & Butterfield, Sandwich, Ont., 1st premium	$25 00
Duke of Jersey, M. L. Frink, Oxford, Mich., 2d premium	20 00
Bull three years old—Sumner Howard, Flint Mich., 1st premium	20 00
Wabesso, M. L. Frink, Oxford, Mich., 2d premium	12 00
C. M. Whitehead, Pontiac, Mich., 3d premium	8 00
Bulls two years old—Maumee Chief, John G. English, Manchester, Mich., 1st premium	15 00
Orange Bay, W. J. G. Dean, Hanover, Mich., 2d premium	10 00
Wright & Butterfield, Sandwich, Ont., 3d premium	5 00
Bull one year old—B. B. Redfield, Lapeer, Mich., 1st premium	10 00
Wright & Butterfield, Sandwich, Ont., 2d premium	5 00
W. J. G. Dean, Hanover, Mich., 3d premium	3 00
Bull calf—John G. English, Manchester, Mich., 1st premium	7 00
Natonio, W. J. G. Dean, Hanover, Mich., 2d premium	5 00
M. L. Frink, Oxford, Mich., 3d premium	3 00
Bull of any age—Wright & Butterfield, Sandwich, Ont.	Diploma

Cows.

Cows four years old or over—Effie Hudson, W. J. G. Dean, Hanover, Mich., 1st premium	$25 00
Wright & Butterfield, Sandwich, Ont., 2d premium	20 00
Cows three years old—Beauty, W. A. Moore, Detroit, Mich., 1st premium	20 00
Skokie Countess, W. J. G. Dean, Hanover, Mich., 2d premium	12 00
Richmond Girl, 2949, H. S. Pingree, Detroit, Mich., 3d premium	3 00
Heifer two years old—Maid of Judah, 2d, W. J. G. Dean, Hanover, Mich., 1st premium	15 00
Wright & Butterfield, Sandwich, Ont., 2d premium	10 00
Pride of Maumee, John G. English, Manchester, Mich., 3d premium	5 00

Heifer one year old—Hoxie, W. J. G. Dean, Hanover, Mich., 1st premium	$10 00
John Lessiter, Jersey, Mich., 2d premium	5 00
B. B. Redfield, Lapeer, Mich., 3d premium	3 00
Heifer calf—Wright & Butterfield, Sandwich, Ont., 1st premium	7 00
Callie Countess, W. J. G. Dean, Hanover, Mich., 2d premium	5 00
Wright & Butterfield, Sandwich, Ont., 3d premium	3 00

CLASS 6.—GALLOWAYS.

Bulls.

Bull four years old or over—Billy McNeil, J. N. Smith, Bath, Mich., 1st premium	$25 00
Bull three years old—Old Pod, J. B. Sutherland, Detroit, Mich., 1st premium,	20 00
Bull two years old—Johnny Hood, R. B. Caruss, St. Johns, Mich., 1st premium,	15 00
Bull one year old—Jeff, J. N. Smith, Bath, Mich., 1st premium	10 00
Bull calf—J. N. Smith, Bath, Mich., 1st premium	7 00
Snowball, J. B. Sutherland, Detroit, Mich., 2d premium	5 00
J. N. Smith, Bath, Mich., 3d premium	3 00

Cows.

Cow four years or over—Rosy McNeil, R. B. Caruss, St. Johns, Mich., 1st premium	$25 00
Topsey, J. B. Sutherland, Detroit, Mich., 2d premium	20 00
Maggie Lauder, J. N. Smith, Bath, Mich., 3d premium	10 00
Cow three years old—Molly Darling, J. B. Sutherland, Detroit, Mich., 1st premium	20 00
Maggie 2d, R. B. Caruss, St. Johns, Mich., 2d premium	12 00
Mary, J. N. Smith, Bath, Mich., 3d premium	8 00
Heifer two years old—Maggie 3d, R. B. Caruss, St. Johns, Mich., 1st premium,	15 00
Jetty, J. N. Smith, Bath, Mich., 2d premium	10 00
Black Beauty, J. B. Sutherland, Detroit, Mich., 3d premium	5 00
Heifer one year old—J. B. Sutherland, Detroit, Mich., 1st premium	10 00
Rosy, R. B. Caruss, St. Johns, Mich., 2d premium	5 00
Jemima 2d, J. N. Smith, Bath, Mich., 3d premium	3 00
Heifer calf—Evangeline, J. B. Sutherland, Detroit, Mich., 1st premium	7 00
Duchess of Sutherland, J. B. Sutherland, Detroit, Mich., 2d premium	5 00
J. N. Smith, Bath, Mich., 3d premium	3 00

CLASS 7.—GRADE CATTLE.

Cow four years old or over—D. S. Holcomb, Jackson, Mich., 1st premium	$20 00
D. S. Holcomb, Jackson, Mich., 2d premium	10 00
David Miller, Clarkston, Mich., 3d premium	5 00
Heifer three years old—R. R. McElwain, Hasting, Mich., 1st premium	15 00
David Miller, Clarkston, Mich., 2d premium	7 00
R. A. Remick, Clarkston, Mich., 3d premium	4 00
Heifer two years old—R. A. Remick, Clarkston, Mich., 1st premium	10 00
David Miller, Clarkston, Mich., 2d premium	5 00
David Miller, Clarkston, Mich., 3d premium	3 00
Yearling Heifer—R. A. Remick, Clarkston, Mich., 1st premium	8 00
David Miller, Clarkston, Mich., 2d premium	5 00
R. A. Remick, Clarkston, Mich., 3d premium	3 00
Heifer Calf—David Miller, Clarkston, Mich., 1st premium	5 00
E. McGonegal, Clarkston, Mich., 2d premium	3 00
C. S. Brooks, Brighton, Mich., 3d premium	2 00
Herd of 1 cow four years old, 1 of three years, 1 of two years and 1 yearling and 1 calf—David Miller, Clarkston, Mich., 1st premium	20 00
Herd of 1 cow four years old, 1 of three years, 1 of two years, and 1 yearling and 1 calf—R. A. Remick, Clarkston, Mich., 2d premium	10 00
Herd of 1 cow four years old, 1 of three years, 1 of two years and 1 yearling and 1 calf—C. S. Brooks, Brighton, Mich., 3d premium	5 00

CLASS 8.—WORKING OXEN AND STEERS.

Yoke five years old or over—Amos G. Wood, Mason, Mich., 1st premium	$20 00
David Miller, Clarkston, Mich., 2d premium	15 00
J. N. Smith, Bath, Mich., 3d premium	10 00
Nye & Foster, Flint, Mich., discretionary	

Yoke four years old—Harvey Judd, Pontiac, Mich., 1st premium	$15 00
E. McGonegal, Clarkston, Mich., 2d premium	10 00
E. McGonegal, Clarkston, Mich., 3d premium	7 00
Yoke three years old—Amos F. Wood, Mason, Mich., 1st premium	10 00
E. McGonegal, Clarkston, Mich., 2d premium	7 00
Yoke two years old—Amos F. Wood, Mason, Mich., 3d premium	8 00
Three year old—E. T. Doney, Jackson, Mich., discretionary, 4th premium	3 00
Yoke two years old—Amos F. Wood, Mason, Mich., 1st premium	5 00
E. T. Doney, Jackson, Mich., 2d premium	5 00
Yoke one year old—Joseph England, Four Towns, Mich., 1st premium	6 00
E. McGonegal Clarkston, Mich., 2d premium	4 00
Joseph England, Four Towns, Mich., 3d premium	2 00
Herd of five yoke of oxen and steers from any one town in the State—Amos F. Wood, Mason, Mich., 1st premium	25 00
Herd of five yoke of oxen or steers from any one town in the State—E. McGonegal, Clarkston, Mich., 2d premium	15 00
Pair of Steer calves—Amos F. Wood, Mason, Mich., discretionary	3 00

CLASS 9.—FAT CATTLE.

Pair of fat oxen—G. A. Smith, Somerset, 1st premium	$30 00
——— Kelley's Corners, 2d premium	20 00
Fat ox, G. A. Smith—Somerset, 1st premium	15 00
Fat cow, D. S. Holcomb—Jackson, 1st premium	15 00
Fat steer, three years old, A. M. Newton, Pontiac	10 00
Alexander McPherson, Howell, 2d premium	5 00
Fat heifer three years old—R. G. Dun, London, Ohio, 1st premium	10 00
E. McGonegal, Clarkston, 2d premium	5 00
Fat steer, two years old—Alex. McPherson, Howell, 1st premium	6 00
Fat heifer, two years old—Alex. McPherson, Howell, 2d (no 1st awarded)	3 00

CLASS 10.—HERDS.

Shorthorns—Avery & Murphy, Detroit, 1st premium	$50 00
Chas. Lincoln, North Lewisburgh, Ohio, 2d premium	30 00
B. W. & H. F. Phelps, Dexter, Mich., 3d premium	20 00
R. G. Dun, London, Ohio, 4th premium	10 00
Herd of Devons—B. F. Peck, East Bethany, N. Y., 1st premium	25 00
Herd Ayrshires—A. J. Wilson, Laporte, Ohio, 1st premium	25 00
Herd of Jerseys—W. J. G. Dean, Hanover, 1st premium	25 00
Wright & Butterfield, Sandwich, Ont., 2d premium	15 00
Herd of Galloways—R. B. Caruss, St. Johns, 1st premium	25 00
J. B. Sutherland, Detroit, 2d premium	15 00
J. N. Smith, Bath, 3d premium	10 00

DIVISION B—HORSES.

CLASS 11.—THOROUGHBREDS.

Stallions four years old and over—General Custer, W. H. Chappel, Detroit, 1st premium	$30 00
Gladstone, R. J. Marsh, Detroit, 2d premium	20 00
Imported Brigadier, H. Haynes, Jackson, 3d premium	10 00
Stallions three years old—Young Rook Mirandi, Ralph Fields, Owosso, 1st premium,	20 00
Michigan, W. B. Drew, Birmingham, 2d premium	15 00
Stallion two years old—W. H. Chappel, Detroit, 1st premium	12 00
Stallion colts—W. H. Chappel, Detroit, 1st premium	7 00
W. H. Chappel, Detroit, 2d premium	5 00
A. B. Donaldson, Fenton, 3d premium	2 00

Mares.

Mare four years old without colt—Katydid, A. B. Donaldson, Fenton, 1st premium,	$15 00
Fanny Howard, W. H. Chappel, Detroit, 2d premium	12 00
Madoqua, Geo. Hendrie, Detroit, 3d premium	
Filly three years old—W. H. Chappel, Detroit, 1st premium	12 00
W. H. Chappel, Detroit, 2d premium	8 00
Filly two years old—W. H. Chappel, Detroit, 1st premium	10 00

CLASS 12.—HORSES FOR ALL WORK.

Stallions five years old and over—King Herod, Etting Hasbrouck, Marshall, 1st premium	$30 00
Royal George, Adam Fox, Colchester, Ont., 2d premium	20 00
Champion Wallace, Fred C. Ronde, Royal Oak, 3d premium	10 00
Stallions four years old—Young Colossus, D. C. Dunham, Wixom, Mich., 1st premium	25 00
John Randolph, Mason, 2d premium	15 00
Isaac Earnst, Atkins, 3d premium	10 00
Stallions three years old—Unknown, A. D. Headley, Leslie, 1st premium	20 00
Mark Hagle, Metamora, 2d premium	15 00
L. D. Haines, Tuscola, 3d premium	10 00
Stallions two years old—Wm. H. Hood, Ionia, 1st premium	12 00
G. S. May, Unadilla, 2d premium	8 00
R. T. Trowbridge, Birmingham, 3d premium	5 00
Stallions one year old—J. E. Rogers, Saline, 1st premium	10 00
B. F. Ingalls, Almont, 2d premium	6 00
F. F. Humphrey, Saline, 3d premium	4 00
Stallion colt—Abel Beers, Pittsburg, 2d premium	5 00

Mares.

Brood mares four years old and over—with colt, May, R. G. McKee, Laingsburg, 1st premium	$20 00
Abel Beers, Pittsburg, 2d premium	15 00
Elisha Lambkin, Brockway, St. Clair Co., 3d premium	10 00
Mare four years old without colt—Nellie, Wm. Smith, Detroit, 1st premium	12 00
Lady Greenville, Caleb Terry, Lansing, 2d premium	8 00
Mare three years old—Topsy, Amos F. Wood, Mason, 1st premium	4 00
Filly two years old—Amos F. Wood, Mason, 1st premium	8 00
Michael Rourke, Owosso, 2d premium	5 00
Avery & Murphy, Detroit, 3d premium	3 00
Filly one year old—M. R. Campbell, Pontiac, 1st premium	7 00
J. E. Rogers, Saline, 2d premium	5 00
C. L. Blanchard, Morenci, 3d premium	3 00
Filly colts—Golden Lass, A. B. Donelson, Pontiac, 1st premium	5 00
Alex. Gregg, Southfield, 2d premium	3 00
J. N. Smith, Bath, 3d premium	2 00

Geldings.

Geldings five years old and over—Old Dandy, Leon Merrill, Utica, 1st premium	$15 00
James Smith, Detroit, 2d premium	10 00
C. L. Blanchard, Morenci, 3d premium	5 00
Gelding four years old—B. F. Ingalls, Almont, 1st premium	12 00
Selim, Caleb Terry, Lansing, 3d premium	4 00
Gelding three years old—James Perry, Redford, Wayne Co., 3d premium	4 00
Gelding four years old—Mark, J. N. Smith, Bath, 1st premium	8 00
Zack, J. N. Smith, Bath, 2d premium	5 00
R. M. Hungerford, Concord, 3d premium	3 00
Gelding one year old—Avery & Murphy, Detroit, 1st premium	6 00
J. N. Smith, Bath, 2d premium	4 00
Span matched horses for all work five years old and over—Topsey and Prince, Harmon Parmerle, Hadley, 1st premium	30 00
B. G. Swift, Clinton, 3d premium	10 00
Span matched horses for all work four years old—R. A. Remick, Detroit, 1st premium	25 00
Span matched horses three years old for all work—J. E. Rogers, Saline, 1st premium	15 00

CLASS 13.—ROADSTERS.

Stallions five years old and over—Louis Napoleon, Dewey & Stewart, Owosso, 1st premium	$30 00
Grand Sentinel, S. A. Browne, Pentwater, 2d premium	20 00
Burns, S. A. Grow, Greenville, 3d premium	10 00
Stallion four years old—Gloster, D. D. Mitchell, Leslie, 1st premium	25 00
Mambrino Tilden, Nye & Foster, Flint, 2d premium	15 00
Lexington Chief, A. C. Fisk, Coldwater, 3d premium	10 00

Stallion three years old--Jerome Eddy, Dewey & Stewart, Owosso, 1st premium	$26 00
Mambrino Turk, Sumner Howard, Flint, 2d premium	15 00
Meteor, Geo. B. Williams, Coldwater, 3d premium	10 00
Stallion two years old—Shylock, J. J. Stellwagen, Wayne, 1st premium	12 00
Solomon Parsons, Union City, 2d premium	8 00
Tecumseh, Nye & Foster, Flint, 3d premium	5 00
Stallion one year old—Geo. R. Fauth, Dewey & Stewart, Owosso, 1st premium	10 00
Wm. Barnes, Pontiac, 2d premium	6 00
Diplomat, S. A. Browne, Pentwater, 3d premium	4 00
Stallion colt--Larry W., Dewey & Stewart, Owosso, 1st premium	7 00
C. L. Blanchard, Morenci, 2d premium	5 00
Abel Beers, Pittsburg, 3d premium	3 00
Brood mares four years old or over with foal at foot--Lady Duncan, S. A. Browne, Pentwater, 1st premium	20 00
Fanny Mapes, Dewey & Stewart, Owosso, 2d premium	15 00
Florence Bashaw, Hiram Elwood, Royal Oak, 3d premium	10 00
Mare four years old and over without colt—Lewis Pike, Jackson, 1st premium	12 00
John Curry, Inkster, 2d premium	8 00
Belfast, Nye & Foster, Flint, 3d premium	5 00
Mares three years old--Nell Buckman, A. C. Fisk, Coldwater, 1st premium	10 00
Gipsey, M. E. Crofoot, Pontiac, 2d premium	6 00
J. N. Kellogg, Albion, 3d premium	4 00
Mare two years old, Golden Rule—M. E. Crofoot, Pontiac, 1st premium	8 00
Lena Mapes, Dewey & Stewart, Owosso, 2d premium	5 00
Lady Drake, Dewey & Stewart, Owosso, 3d premium	3 00
Mare one year old—Amethyst, S. A. Browne, Pentwater, 1st premium	7 00
M. E. Crofoot, Pontiac, 2d premium	5 00
Phillips & Gregory, Dansville, 3d premium	2 00
Filly colt—Susie Lockwood, Dewey & Stewart, Owosso, 1st premium	5 00
Saline, S. A. Browne, Pentwater, 2d premium	3 00
Annie Clutes, Dewey & Stewart, Owosso, 3d premium	2 00
Geldings five years old and over--Lewis Pike, Jackson, 1st premium	15 00
M. Greene, Detroit, 2d premium	10 00
Fred S., H. H. Thomas, New Baltimore, 3d premium	5 00
Geldings four years old—Buffalo Bill, A. C. Fisk, Coldwater, 1st premium	12 00
Geldings four years old—Seline Boy, Dewey & Stewart, Owosso, 1st premium	10 00
James D. Perry, Redford, 3d premium	4 00
Geldings two years old--Madison Greene, Farmington, 1st premium	8 00
Butcher Boy, Abel Beers, Pittsburg, 2d premium	5 00
Gelding one year old—Charles B., Abel Beers, Pittsburg, 1st premium	6 00

CLASS 14.—BEST PAIR DRIVING HORSES NOT USED FOR SPORTING PURPOSES TO ROAD WAGON.

Best pair driving horses—R. A. Smith, Detroit, 1st premium	$30 00
Dr. Andrew J. B. Jenner, Detroit, 2d premium	20 00
Charles Saunders, Detroit, 3d premium	10 00
Time, 3.14½.	
Single mare or gelding five years or over—Sam Patch, J. W. Hewitt, Jackson, 1st premium	30 00
Wm. A. Owen, Detroit, 2d premium	20 00
Ruff, D. F. Woodcock, Lansing, 3d premium	10 00
Single mare or gelding four years old to wagon—Bill Smith, A. C. Fisk, Coldwater, 1st premium	20 00
Western Girl, Wm. Barnes, Pontiac, 2d premium	15 00
John C. Blake Tekonsha, 3d premium	10 00

CLASS 15.—DRAUGHT HORSES.

Stallion five years old or over—King of the West, Samuel Dunseith, Stratford, Canada, 1st premium	$30 00
Lamento Eldorado, H. M. Skinner, Maple Rapids, 2d premium	20 00
Edwin Phelps, Pontiac, 3d premium	10 00
Stallion four years old—Enchanter, Avery & Murphy, Detroit, 1st premium,	25 00
Phillips & Gregory, Dansville, 2d premium	15 00
Young Drayman, James Dowler, Petrolia, Canada, 3d premium	10 00

Stallion three years old—Isaac Earnest, Atkins, 1st premium $20 00
John McNames, Marshall, 2d premium 12 00
Stallion two years old—Vendome, J. T. Parker, Mt. Clemens, 1st premium ... 10 00
Stallion one year old—Dan, J. C. Chilson, Livonia, 1st premium 8 00
Adam Kulmback, Silvan, 2d premium 5 00
James McDonough, Goderich, Canada, 3d premium 3 00
Stallion colt—Avery & Murphy, Detroit, 1st premium 5 00
Avery & Murphy, Detroit, 2d premium 3 00
Draught mare four years old and over—Maggie Lauder, Avery & Murphy, Detroit, 1st premium 25 00
James McDonough, Goderich, Canada, 2d premium 15 00
Mary, Avery & Murphy, Detroit, 3d premium 10 00
Mare three years old—R. W. Miller, Vassar, 1st premium 12 00
Bay Empress, Avery & Murphy, Detroit, 2d premium 8 00
Mare two years old—Rosa Bell, Avery & Murphy, Detroit, 1st premium 10 00
Mare one year old—Guy Rose, Avery & Murphy, Detroit, 1st premium 8 00
Filly colt—James McDonough, Goderich, Canada, 1st premium 5 00
Avery & Murphy, Detroit, 2d premium 3 00
John Callihan, Frinserville, 3d premium 2 00

CLASS 16.—MATCHED CARRIAGE HORSES.

Matched carriage horses 16 hands or over, five years old or over—Henry Haines, Jackson, 1st premium $30 00
Matched carriage horses 16 hand or over, four years old—Geo. H. Graves Albion, 1st premium 25 00
Matched carriage horses under 16 hands, four years old and over—Wm. Willetts, Pontiac, 1st premium 30 00
James Ross, Ridgetown, Ontario, Canada, 2d premium 20 00
H. S. Thomas, New Baltimore, 3d premium 10 00
Pair matched carriage horses, three years old—George H. Gorman, Franklin, 1st premium 20 00
Abel Beers, Pittsburgh, 2d premium 12 00
Single carriage horses four year old, mare or gelding—Stewart Beatty, Utica, 1st premium 12 00
James McClumpha, Plymouth, 2d premium 8 00
Single carriage horses three years old, mare or gelding—Henry McMasters, 1st Birmingham, 1st premium 10 00
L. D. Owen, Farmington, 2d premium 7 00

CLASS 17.—BREEDER'S SPECIAL PREMIUMS.

Stallion five years old or over, to harness, Black Cloud—A. H. Cutter, Parma, 1st premium $125 00
Oceana Chief, John Boga, Pentwater, 2d premium 100 00
Burns, S. A. Grow, Greenville, 3d premium 75 00
Time, 2.38¼, 2.35½, 2.37, mile heats.
Stallion four years old—Brush Hambletonian, John C. Blake, Tekonsha, 1st premium 100 00
Magna Seline, Wm. Wales, Disco, 2d premium 75 00
Notable, Wm. Martin, Lyons, 3d premium 50 00
Time, 3.06¾, 3.02¾.
Stallion three years old—Jerome Eddy, Dewey & Stewart, Owosso, 1st premium 50 00
W. T. Bishop, John C. Blake, Tekonsha, 2d premium 30 00
Tipsice, Nye & Poster, Flint, 3d premium 20 00
Time, 1.22¾, 1.27¼, 1.27½, mile heats.
Stallion two years old—Shylock, J. J. Stellwagen, Wayne, 1st premium 30 00
Lake Shore, Ray Warren, Coldwater, 2d premium 25 00
Prince Bismark, John R. Sorsby, Birmingham, 3d premium 15 00
Time, 1.43½, 1.43, half mile heats.

CLASS 17½.—BREEDER'S SPECIAL PREMIUMS.

Mares or gelding five years old or over—Fred Hooper, W. R. Armstrong, Almont, 1st premium $125 00
Lady Moscow, Scott McLean, Coldwater, 2d premium 100 00
John S., John S. Foster, Hudson, 3d premium 75 00
Time, 2.34, 2.40, 2.34¾.

Mares or gelding four years old—Buffalo Bill, A. C. Fisk, Coldwater, 1st premium	$100 00
Irene, Lewis Pike, Jackson, 2d premium	75 00
Bell Smith, A. C. Fisk, Coldwater, 3d premium	50 00
Time, 2.48, 2.42¾, 2.40¼.	
Mares or geldings three years old—Nell Buckman, A. C. Fisk, Coldwater, 1st premium	50 00
Belle of Shelby, D. B. Pearsoll, Disco, 2d premium	30 00
Time, 1.30¼, 1.37¾.	
Mares and geldings two years old—Ella D., J. F. Maisner, Marshall, 1st premium	30 00
Golden Rule, M. E. Crofoot, Pontiac, 2d premium	25 00
Alma D., A. B. Donelson, Pontiac, 3d premium	15 00
Time, 1.38¾, 1.36¾, half mile heats.	

CLASS 17½.—STALLIONS ANY AGE TO SADDLE.

Creighton, Jr., J. T. Bower, Colon, 1st premium	$100 00
Utico, Isaac B. Malcom, Lowell, 2d premium	75 00
Albert Draper, Aaron Crego, Flint, 3d premium	50 00
Time, 1.56, 1.49¾.	
Mares and geldings any age over three years—Blink Bonnie, Wm. Melon, Colon, 1st premium	75 00
Twinkle, Eb. Remmington, Battle Creek, 2d premium	50 00
W. H. Chappel, Detroit, 3d premium	25 00
Time, 1.54¼, 1.50½, 1.52½.	

CLASS 18.—SWEEPSTAKE FOR STALLION WITH NOT LESS THAN NINE OF HIS OWN GET.

Louis Napoleon, Dewey & Stewart, Owosso, 1st premium	$40 00
Golden Bow, A. B. Donelson, Pontiac, 2d premium	20 00
Special premiums were awarded to Sanburn & Stebbins, of Port Huron, for a herd of 10 Shetland ponies	5 00
To James Perkins, of Almont, for a span of yearling colts broken to harness,	2 00
To Wm. A. Owen, of Detroit, for Shetland stallion	2 00

REPORTS OF COMMITTEE IN DIVISION B.

In Class 11, Thoroughbreds, the horse General Rankin was protested, but as he did not appear when called for, we took no notice of the protest.

SAMUEL BROWNE,
H. K FARRAND,
SUMNER HOWARD,
Committee.

Through a misunderstanding and mistake in giving a white ribbon to the horse Gloster, entered in Class 17, No. 31, which was intended for Lexington Chief, Class 13, No. 31, Gloster was sent to the stables, and when called in his class shortly afterwards, did not appear, and your judges on hearing the circumstances, gave Mr. Peacock, the owner, at his request, a privilege of showing his horse, and as we considered him a very fine animal, recommended a special premium be awarded to the stallion Gloster, of $10.

W. G. PATTERSON,
W. H. COBB,
H. K. FARRAND,
Committee.

Class 18.—The horse Monogram, entry No. 3, showed only six colts, which did not entitle him to compete. The committee regard him as a horse of great merit as a sire of stylish carriage horses. He is a horse of wonderful style, and the six yearling colts shown with him are, taken together, the best six colts of one age that we have seen together. We recommend him to the favorable notice of the Executive Committee.

J. H. MORRIS,
ANDREW H. CUTTER,
H. K. FARRAND,
Committee.

The thoroughbred horse Gen. Custer and nine colts, entry No. 4 in Class 18, the committee regard as of great merit, but did not feel warranted in awarding a premium over the exhibitors of practical horses for business purposes, yet we recommend to the favorable notice of the Executive Committee as worthy of a special premium.

J. H. MORRIS,
ANDREW H. CUTTER,
H. K. FARRAND,
Committee.

DIVISION C—SHEEP.

CLASS 19.—THOROUGHBRED MERINOS.

Buck two years old or over—A. A. Wood, Saline, 1st premium	$15 00
A. A. Wood, Saline, 2d premium	10 00
Buck, one year old—A. A. Wood, Saline, 1st premium	12 00
W. Ball, Hamburg, 2d premium	8 00
W. Ball, Hamburg, 3d premium	4 00
Three buck lambs—W. Ball, Hamburg, 1st premium	10 00
Three ewes two years old or over—W. Ball, Hamburg, 1st premium	15 00
A. A. Wood, Saline, 2d premium	10 00
J. S. Wood, Saline, 3d premium	5 00
Three ewes one year old—W. Ball, Hamburgh, 1st premium	12 00
J. S. Wood, Saline, 2d premium	8 00
A. A. Wood, Saline, 3d premium	4 00
Three ewe lambs—A. A. Wood, Saline, 1st premium	10 00
W. Ball, Hamburg, 2d premium	5 00
W. Ball, Hamburg, 3d premium	3 00

CLASS 20.—AMERICAN MERINOS.

Buck two years old or over—F. C. Wood, Saline, 1st premium	$15 00
Van Gieson Bros., Clinton, 2d premium	10 00
F. C. Wood, Saline, 3d premium	5 00
Buck one year old—Van Gieson Bros., Saline, 1st premium	12 00
A. A. Wood, Saline, 2d premium	8 00
Wm. Ball, Hamburg, 3d premium	4 00
Three buck lambs—Van Gieson Bros., Clinton, 1st premium	10 00
A. A. Wood, Saline, 2d premium	5 00
Three ewes two years old or over—Wm. Ball, Hamburg, 1st premium	15 00
A. A. Wood, Saline, 2d premium	10 00
F. C. Wood, Saline, 3d premium	5 00
Three ewes one year old or over—Van Gieson Bros., Clinton, 1st premium	12 00
Wm. Ball, Hamburg, 2d premium	8 00
A. A. Wood, Saline, 3d premium	4 00
Three ewe lambs—Wm. Ball, Hamburg, 1st premium	10 00
Van Gieson Bros., Clinton, 2d premium	5 00
F. C. Wood, Saline, 3d premium	3 00

CLASS 20½.—FINE WOOL GRADES.

Three ewes two years old or over—Solomon Hatch, Charlotte, 1st premium	$10 00
C. S. Brooks, Brighton, 2d premium	6 00
J. N. Smith, Bath, 3d premium	4 00
Three ewes one year old—Solomon Hatch, Charlotte, 1st premium	8 00
J. N. Smith, Bath, 2d premium	6 00
J. N. Smith, Bath, 3d premium	3 00
Three ewe lambs—Solomon Hatch, Charlotte, 1st premium	8 00
C. S. Brooks, Brighton, 2d premium	4 00
J. N. Smith, Bath, 3d premium	2 00

CLASS 21.—SOUTHDOWNS.

Buck two years old or over—Protested, 1st premium	$10 00
Protested, 2d premium	6 00
Yearling buck—Caleb Terry, Lansing, 1st premium	10 00
Mrs. Ann Newton, Pontiac, 2d premium	6 00
Mrs. Ann Newton, Pontiac, 3d premium	4 00

Pen of buck lambs—John Lessiter, Jersey, 1st premium	$8 00
Mrs. Ann Newton, Pontiac, 2d premium	5 00
Benjamin D. Kelly, Ypsilanti, 3d premium	3 00
Three ewes two years old or over—Mrs. Ann Newton, Pontiac, 1st premium	10 00
John Lessiter, Jersey, 2d premium	6 00
John Lessiter, Jersey, 3d premium	4 00
Three ewes one year old—John Lessiter, Jersey, 1st premium	10 00
Mrs. Ann Newton, Pontiac, 2d premium	6 00
Caleb Terry, Lansing, 3d premium	4 00
Three ewe lambs—Mrs. Ann Newton, Pontiac, 1st premium	8 00
John Lessiter, Jersey, 2d premium	3 00

CLASS 21½.—MIDDLE WOOL SHEEP OTHER THAN SOUTHDOWNS.

Buck two years old or over—Mrs. Ann Newton, Pontiac, 1st premium	$10 00
Daniel Whitefield, Pontiac, 2d premium	6 00
Thomas A. Moore, Ypsilanti, 3d premium	4 00
Yearling buck—Mrs. Ann Newton, Pontiac, 1st premium	10 00
Thomas A. Moore, Ypsilanti, 2d premium	6 00
Mrs. Ann Newton, Pontiac, 3d premium	4 00
Pen of buck lambs—Thomas A. Moore, Ypsilanti, 1st premium	8 00
Mrs. Ann Newton, Pontiac, 2d premium	5 00
Daniel Whitfield, Pontiac, 3d premium	3 00
Three ewes two years old and over—Mrs. Ann Newton, Pontiac, 1st premium	10 00
Mrs. Ann Newton, Pontiac, 2d premium	6 00
Thomas A. Moore, Ypsilanti, 3d premium	4 00
Three ewes one year old—Mrs. Ann Newton, Pontiac, 1st premium	10 00
Daniel Whitfield, Pontiac, 2d premium	6 00
Thomas A. Moore, Ypsilanti, 2d premium	4 00
Three ewe lambs—Mrs. Ann Newton, Pontiac, 1st premium	8 00
Daniel Whitfield, Pontiac, 2d premium	5 00
Thomas A. Moore, Ypsilanti, 3d premium	3 00

CLASS 22.—LEICESTERS.

Buck two years old or over—Amos F. Wood, Mason, 1st premium	$10 00
Wm. Bedford, Thamesville, Ont., 2d premium	6 00
Mrs. Ann Newton, Pontiac, 3d premium	4 00
Yearling buck—Mrs. Ann Newton, Pontiac, 1st premium	10 00
Amos F. Wood, Mason, 2d premium	6 00
W. G. Baldwin, Colchester, Ont., 3d premium	4 00
Pen of 3 buck lambs—Wm. Bedford, Thamesville, Ont., 1st premium	8 00
Mrs. Ann Newton, Pontiac, 2d premium	5 00
W. G. Baldwin, Colchester, Ont., 3d premium	3 00
Three ewes two years old—Mrs. Ann Newton, Pontiac, 1st premium	10 00
Amos F. Wood, Mason, 2d premium	6 00
Amos F. Wood, Mason, 3d premium	4 00
Three ewes one year old—Mrs. Ann Newton Pontiac, 1st premium	10 00
Amos F. Wood, Mason, 2d premium	6 00
Wm. Bedford, Thamesville, Ont., 3d premium	4 00
Three ewe lambs—Mrs. Ann Newton, Pontiac, 1st premium	8 00
Wm. Bedford, Thamesville, Ont., 2d premium	5 00
Amos F. Wood, Mason, 3d premium	3 00

CLASS 23.—COTSWOLD AND OTHER LONG WOOLED SHEEP.

Buck two years old or over—Mrs. Ann Newton, Pontiac, 1st premium	$10 00
Yearling buck—Patrick McLevir, Jarvis, Ont., 1st premium	10 00
Patrick McLevir, Jarvis, Ont., 2d premium	6 00
Patrick McLevir, Jarvis, Ont., 3d premium	4 00
Pen of three buck lambs—Patrick McLevir, Jarvis, Ont., 1st premium	8 00
Patrick McLevir, Jarvis, Ont., 2d premium	5 00
Patrick McLevir, Jarvis, Ont., 3d premium	3 00
Three ewes two years old or over—Mrs. Ann Newton, Pontiac, 1st premium	10 00
Three ewes one year old—Patrick McLevir, Jarvis, Ont., 1st premium	10 00
Mrs. Ann Newton, Pontiac, 2d premium	6 00
Patrick McLevir, Jarvis, Ont., 3d premium	4 00
Three ewe lambs—Patrick McLevir, Jarvis, Ont., 1st premium	8 00
Mrs. Ann Newton, Pontiac, 2d premium	5 00

CLASS 24.—FAT SHEEP.

Pen middle wooled sheep—Mrs. Ann Newton, Pontiac, 1st premium	$8 00
Mrs. Ann Newton, Pontiac, 2d premium	5 00
John Lessiter, Jersey, 3d premium	3 00
Pen long wooled sheep—Mrs. Ann Newton, Pontiac, 1st premium	8 00
Mrs. Ann Newton, Pontiac, 2d premium	5 00
Thomas A. Moore, Ypsilanti, 3d premium	3 00
Pen grade fat sheep—Thomas A. Moore, Ypsilanti, 1st premium	8 00

The celebrated Ram "Gov. Sprague," owned by Hatch & Lossee, from Darien, N. Y., was upon the ground, but too late for entry for premium, was favorably noticed as being a splendid animal.

D. H. STONE,
B. G. BUELL,
E. KELLOGG.
Committee.

J. A. Moore, of Ypsilanti, exhibited some very fine sheep, cross bred yearling ewes of Shropshire South Down and Merino of 22 years crossing, that were very fine, possessing heavy carcasses and great weight of fleece and length of wool, would recommend as being worthy of a premium.

D. H. STONE,
B. G. BUELL,
E. KELLOGG,
Committee.

Class 21½ was a large and fine show. Mrs. Newton showed a very fine pen of cross bred lambs worthy of notice.

W. S. HART,
PETER HAGLE,
Committee.

Your committee in class 22, whose duty it was to make awards on this class, would respectfully report a fine exhibition in this class which our whole State has no reason to be ashamed of, and have endeavored to award premiums according to real merit.

H. G. HOLT,
WM. WHITE,
WM. ARMOUR,
Committee.

In class 23, your committee take pleasure in saying that the exhibition is in no way inferior to former years, and we think that there is a growing interest in the State in regard to all good sheep of which the long wools are a prominent feature, and we would recommend that the present classification be continued.

H. G. HOLT,
WM. WHITE,
WM. ARMOUR,
Committee.

DIVISION D—SWINE.

CLASS 23.—BERKSHIRES.

Boar two years old or over—Wm. Smith, Detroit, 1st premium	$12 00
A. A. McArthur, Lobo, Ont., 2d premium	8 00
Wm. Smith, Detroit, 3d premium	4 00
Boar one year old—A. A. McArthur, Lobo, Ont., 1st premium	10 00
Wm. Smith, Detroit, 2d premium	6 00
Wm. Smith, Detroit, 3d premium	3 00
Brood sow two years old, Wm. Smith, Detroit, 1st premium	12 00
D. F. Vickery, Charlotte, 2d premium	8 00
Wm. Smith, Detroit, 3d premium	4 00
Sow one year old—A. A. McArthur, Lobo, Ont., 1st premium	10 00
Wm. Smith, Detroit, 2d Detroit	6 00
N. A. Clapp, Wixom, 3d premium	3 00
Pen of pigs, not less than 4 nor over 10 months old—D. F. Vickery, Charlotte, 1st	10 00
Wm. Smith, Detroit, 2d premium	6 00
N. A. Clapp, Wixom, 3d premium	3 00
Boar of any age—A. A. McArthur, Lobo, Ont	Dip.

In regard to the display of Berkshire swine on exhibition, your committee would report, that their task was a very difficult one on account of the large display of the very finest bred stock. And if there were any premiums given where they should not have gone, it was on account of your committee not being able to say which was most perfect where all were so near perfection.

G. D. BOYCE,
H. G. HOLT,
J. C. CHILSON,
Committee.

Essex.

Boar two years old or over,—Wm. Smith, Detroit, 1st premium	$12 00
E. T. Doney, Jackson, 2d premium	8 00
Boar 1 year old, Eber W. Cottrell, Detroit, 1st premium	10 00
J. N. Smith, Bath, 2d premium	6 00
Brood sow two years or over,—Eber W. Cottrell, Detroit, 1st premium	12 00
Wm. Smith, Detroit, 2d premium	8 00
Sow one year old, Eber W. Cottrell—Detroit, 1st premium	10 00
E. T. Doney, Jackson, 2d premium	6 00
J. N. Smith, Bath, 3d premium	3 00
Pen of pigs, not less than four in number, nor over ten months old—Wm. Smith, Detroit, 1st premium	10 00
Wm. Bedford, Thamesville, Ont., 2d premium	6 00
E. T. Doney, Jackson, 3d premium	3 00
Boar of any age—Wm. Smith, Detroit	Dip.

In the display of swine, your committee beg leave to report, that as a whole the show was a credit to our beautiful State, and although the stock exhibited did not all receive premiums, it was not because they were unworthy. And your committee feel assured that there is a deep and growing interest manifested in this very important branch of agriculture which will surely place Michigan in the front rank sooner or later.

G. D. BOYCE,
H. G. HOLT,
J. C. CHILSON,
Committee.

Suffolk.

Boar two years old or over—Wm. Smith, Detroit, 1st premium	$12 00
Wm. Smith, Detroit, 2d premium	8 00
D. V. Vickery, Charlotte, 3d premium	4 00
Boar one year old—Wm. Smith, Detroit, 1st premium	10 00
Eber W. Cottrell, Detroit. 2d premium	6 00
Albert G. Gates, Otsego, 3d premium	3 00
Brood sow two years old or over—Eber W. Cottrell, Detroit, 1st premium	12 00
Wm. Smith, Detroit, 2d premium	8 00
Sow one year old—Wm. Smith, Detroit, 1st premium	10 00
Wm, Smith, Detroit, 2d premium	6 00
D. F. Vickery, Charlotte, 3d premium	3 00
Pen of pigs not less than four in number nor over 10 months old—Wm. Smith, Detroit, 1st premium	10 00
Wm. Smith, Detroit, 2d premium	6 00
D. F. Vickery, Charlotte, 3d premium	3 00
Boar of any age—Wm. Smith, Detroit	Diploma

In regard to the display in this class, your committee beg leave to report that Michigan is still working her way up as a stock State, and a home of fine stock, and your committee were not obliged to spend any time in viewing inferior stock, as there was none on exhibition.

G. D. BOYCE.
H. G. HOLT,
J. C. CHILSON,
Committee.

Poland China or other Large Breeds.

Boar two years old or over—Sambo, C. W. Jones, Richland, 1st premium	$12 00
Boar one year old—Jim Crow. C. W. Jones, Richland, 1st premium	10 00
R. H. Hungerford, Concord, 2d premium	6 00

Sow two years old or over—Little Reevie, C. W. Jones, Richland, 1st premium,	$12 00
Queen, C. W. Jones, Richland, 2d premium	8 00
Reliable, C. W. Jones, Richland, 3d premium	4 00
Sow one year old—Viola, C. W. Jones, Richland, 1st premium	10 00
Bessy Grant, C. W. Jones, Richland, 2d premium	6 00
Pen of pigs, not less than four in number, nor over 10 months old—R. H. Hungerford, Concord, 1st premium	10 00
C. W. Jones, Richland, 2d premium	6 00
C. W. Jones, Richland, 3d premium	3 00
Boar of any age—Sambo, C. W. Jones, Richland	Diploma
Jim Crow, C. W. Jones, Richland	Diploma

Fat Hogs.

Best fat hog one year old—Wm. Smith, Detroit, 1st premium	$10 00
R. H. Hungerford, Concord, 2d premium	6 00
Best fat pig less than 10 months old—Wm. Smith, Detroit, 1st premium	6 00
Wm. Smith, Detroit, 2d premium	4 00
R. H. Hungerford, Concord, 3d premium	2 00

In the display of Poland Chinas, your committee beg leave to report that the display was very creditable to our beautiful State, and although each pen was not decorated with either blue, red or white, we take pleasure in saying without exception the stock was fine and worthy.

G. D. BOYCE,
H. G. HOLT,
J. C. CHILSON,
Committee.

DIVISION E.—POULTRY.

For the best, most varied, and most valuable collection of Poultry, entered and owned by one exhibitor,

Hayes & McElwain, Hastings, 1st premium	$15 00
W. & J. B. Clark, Sandwich, Ont., 2d premium	10 00

Asiatic Class.

Light Brahma fowls—W. & J. B. Clark, Sandwich, Ont., 1st premium	$2 00
W. & J. B. Clark, Sandwich, Ont., 2d premium	1 00
Light Brahma chicks—W. & J. B. Clark, Sandwich, Ont., 1st premium	2 00
W. & J. B. Clark, Sandwich, Ont., 2d premium	1 00
Dark Brahma fowls—Hayes & McElwain, Hastings, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Dark Brahma chicks—Hayes & McElwain, Hastings, 1st premium	2 00
Armstrong, Crawford & Jones, Owosso, 2d premium	1 00
Buff Cochin fowls—W. & J. B. Clark, Sandwich, Ont., 1st premium	2 00
W. & J. B. Clark, Sandwich, Ont., 2d premium	1 00
Buff Cochin chicks—E. Woolfenden, Detroit, 1st premium	2 00
E. Woolfenden, Detroit, 2d premium	1 00
Patridge Cochin fowls—E. Woolfenden, Detroit, 1st premium	2 00
Armstrong, Crawford & Jones, Owosso, 2d premium	1 00
Patridge Cochin chicks—Armstrong, Crawford & Jones, Owosso, 1st premium.	2 00
Hayes & McElwain, Hasting, 2d premium	1 00
White Cochin fowls—Hayes & EcElwain, Hastings, 1st premium	2 00
White Cochin chicks—Hayes & McElwain, Hastings, 2d premium	1 00
Black Cochin fowls—A. A. Bennett, Mason, 2d premium	1 00
Black Cochin chicks—Hayes & McElwain, Hastings, 1st premium	2 00
E. H. Nichols, Williamston, 2d premium	1 00

Dorking Class.

Colored Dorkings, except silver grey—Armstrong, Crawford & Jones, Owosso, 1st premium	$2 00
White Dorkings, fowls—W. & J. B. Clark, Sandwich, Ont., 2d premium	1 00
Dominique chicks—Armstrong, Crawford & Jones, Owosso, 2d premium	1 00

American Class.

Plymouth Rock fowls—Armstrong, Crawford & Jones, Owosso, 1st premium,	$1 00
Plymouth Rock chicks—Armstrong, Crawford & Jones, Owosso, 1st premium,	2 00
E. H. Nichols, Williamston, 2d premium	1 00

Game Class.

Black-breasted red game fowls—S. W. Curtis, Monroe, 1st premium	$2 00
S. W. Curtis, Monroe, 2d premium	1 00
Black-breasted red game chicks—S. W. Curtis, Monroe, 1st premium	2 00
S. W. Curtis, Monroe, 2d premium	1 00
Duckwing game fowls—S. W. Curtis, Monroe, 1st premium	2 00
S. W. Curtis, Monroe, 2d premium	1 00
Duckwing game chicks—S. W. Curtis, Monroe, 1st premium	2 00
S. W. Curtis, Monroe, 2d premium	1 00
Pair white-legged early Derby game fowls—S. W. Curtis, Monroe, 1st premium	2 00
Pair white-legged early Derby game chicks—S. W. Curtis, Monroe, 1st premium	2 00

Spanish Class.

Pair black Spanish fowls—W. & J. B. Clark, Sandwich, 1st premium	$2 00
W. & J. B. Clark, Sandwich, 2d premium	1 00
Pair black Spanish chicks—W. & J. B. Clark, Sandwich, 1st premium	2 00
W. & J. B. Clark, Sandwich, 2d premium	1 00
Pair white Leghorn fowls—N. A. Bennett, Mason, 1st premium	2 00
Pair white Leghorn chicks—N. A. Bennett, Mason, 1st premium	2 00
E. S. Marvin, Detroit, 2d premium	1 00
Pair brown Leghorn fowls—Ambrose Purchase, Auburn, 1st premium	2 00
Pair brown Leghorn chicks—Boaz Rossiter, Detroit, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00

Polish Class.

Pair black Polish white-crest fowls—W. & J. B. Clark, Sandwich, 1st premium	$2 00
W. & J. B. Clark, Sandwich, 2d premium	1 00
Pair black Polish white-crest chicks—W. & J. B. Clark, Sandwich, 1st premium	2 00
W. & J. B. Clark, Sandwich, 2d premium	1 00
Pair silver Polish fowls—Hayes & McElwain, Hastings, 1st premium	2 00
Ambrose Purchase, Auburn, 2d premium	1 00
Pair silver Polish chicks—Hayes & McElwain, Hastings, 2d premium	1 00

French Class.

Pair Houdan fowls—N. A. Bennett, Mason, 1st premium	$2 00
Fisher & Hammon, Ann Arbor, 2d premium	1 00
Pair Houdan chicks—E. H. Nichols, Williamston, 1st premium	2 00
N. A. Bennett, Mason, 2d premium	1 00

Hamburg Class.

Pair golden-spangled Hamburg chicks—Hayes & Elwain, Hastings, 1st premium	$2 00
Hayes & McElwain, Hastings, 2d premium	2 00
Pair silver-spangled Hamburg fowls—Hayes & McElwain, Hastings, 1st premium	2 00
Hunter Harwood, Detroit, 2d premium	1 00
Pair silver-spangled Hamburg chicks—Hayes & McElwain, Hastings, 1st premium	2 00

Miscellaneous Class.

Pair Silkies—Fisher & Hammon, Ann Arbor, 1st premium	$2 00

Bantam Class.

Pair black-breasted red game bantam fowls—S. W. Curtis, Monroe, 1st premium	$2 00
Fisher & Hammon, Ann Arbor, 2d premium	1 00
Pair black-breasted red game bantam chicks—S. W. Curtis, Monroe, 1st premium	2 00
Armstrong, Crawford & Jones, Owosso, 2d premium	1 00
Pair duckwing game bantam fowls—S. W. Curtis, Monroe, 1st premium	2 00
S. W. Curtis, Monroe, 2d premium	1 00

Pair duckwing game bantam chicks—S. W. Curtis, Monroe, 1st premium	$2 00
F. C. Whitney, Detroit, 2d premium	1 00
Pair white bantam chicks—Armstrong, Crawford & Jones, Owosso, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Pair African bantam fowls—C. M. Page, Ogden, 1st premium	2 00

Non-enumerated Class.

Pair golden pencilled Hamburg fowls—Fisher & Hammon, Ann Arbor, 1st premium	2 00
W. & J. B. Clark, Sandwich, 2d premium	1 00
Pair golden pencilled Hamburg chicks—Fisher & Hammon, Ann Arbor, 1st premium	2 00
John Mahoney, Detroit, 2d premium	1 00
Pair white Henny game fowls—R. W. Beach, Detroit, 1st premium	2 00
Pair American Seabright fowls—Armstrong, Crawford & Jones, Owosso, 1st premium	2 00
Armstrong, Crawford & Jones, Owosso, 2d premium	1 00
Pair Malay bantam chicks—Armstrong, Crawford & Jones, Owosso, 1st premium	2 00
Pair buff or bronze geese—Armstrong, Crawford & Jones, Owosso, 2d premium	1 00
Pair black Hamburg fowls—W. & J. B. Clark, Sandwich, Ont., 1st premium	2 00
Pair black Hamburg chicks—W. & J. B. Clark, Sandwich, Ont., 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Pair silver grey Dorking fowls—Hayes & McElwain, Hastings, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Pair silver grey Dorking chicks—Hayes & McElwain, Hastings, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Pair pea comb part Cochin fowls—Hayes & McElwain, Hastings, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Pair pea comb part Cochin chicks—Hayes & McElwain, Hastings, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00
Pair brown red game fowls—Hayes & McElwain, Hastings, 1st premium	2 00
Pair brown red game chicks—S. W. Curtis, Monroe, 1st premium	2 00
S. W. Curtis, Monroe, 2d premium	1 00
Pair bronze geese—Ambrose Purchase, Auburn, 1st premium	2 00
Ornamental ducks—W. A. Holcomb, Francisco, 1st premium	2 00

Turkey Class.

Pair white turkeys—N. A. Bennett, Mason, 1st premium	2 00
Ambrose Purchase, Auburn, 2d premium	1 00
Pair gray turkeys, Ambrose Purchase, Auburn, 1st premium	2 00
Pair black turkeys, Hayes & McElwain, Hastings, 1st premium	2 00
Pair pearl guinea fowls—N. A. Bennett, Mason, 1st premium	
Ambrose Purchase, Auburn, 2d premium	
Pair white guinea fowls—Ambrose Purchase, Auburn, 1st premium	2 00
Ambrose Purchase, Auburn, 2d premium	1 00
Pair pea fowls—N. A. Bennett, Mason, 1st premium	2 00
Hayes & McElwain, Hastings, 2d premium	1 00

Goose Class.

Pair Toulouse geese—Armstrong, Crawford & Jones, Owosso, 1st premium	2 00
N. A. Bennett, Mason, 2d premium	1 00
Pair Bremen geese, Ambrose Purchase, Auburn, 1st premium	2 00
Ambrose Purchase, Auburn, 2d premium	1 00
Pair brown China geese—N. A. Bennett, Mason, 1st premium	2 00
Pair white China geese—W. A. Holcomb, Francisco, 1st premium	2 00

DIVISION F.

CLASS 27.—FARM PRODUCTS.

R. M. Webster, Armada, bushel red wheat, 1st premium	$6 00
Geo. W. Prescott, Grand Rapids, Mich., bushel red wheat, 2d premium	4 00

Henry Bidwell, Plymouth, bushel white wheat, 1st premium	$6 00
John Spalding, Sault Ste. Marie, bushel white wheat, 2d premium	4 00
Henry Bidwell, Plymouth, bushel spring wheat, 1st premium	5 00
John Spalding, Sault Ste. Marie, bushel spring wheat, 2d premium	3 00
J. F. Stabler, Ann Arbor, bushel white rye, 1st premium	5 00
Geo. W. Prescott, Grand Rapids, bushel four-rowed barley, 2d premium	3 00
David Woodman, Paw Paw, bushel four-rowed barley, 1st premium	5 00
J. W. Blowers, Lawrence, bushel oats, 1st premium	5 00
L. B. Lawrence, Little Prairie Ronde, 2d premium	3 00
John Spalding, Sault Ste. Marie, bushel barley, 2d premium	3 00
David Woodman, Paw Paw, 1st premium	4 00
David Woodman Paw Paw, bushel dent corn in ear, 1st premium	5 00
Wright & Butterfield, Sandwich, Ont., 2d premium	2 00
David Woodman, Paw Paw, Flint corn in ear, 1st premium	5 00
Henry Morley, Detroit, 2d premium	3 00
Charles Lerchen, Greenfield, bushel early Compton corn, 1st premium	5 00
Geo. W. Prescott, Grand Rapids, bushel blaze corn, 2d premium	3 00
John Spalding, Sault Ste. Marie, bushel peas, 1st premium	5 00
Henry Bidwell, Plymouth, 2d premium	3 00
R. M. Webster, Armada, bushel white beans, 1st premium	5 01
Henry Bidwell, Plymouth, 2d premium	3 00
David Woodman, Paw Paw, bushel large clover seed, 1st premium	5 00
D. L. Garver, Hart, 2d premium	3 00
J. W. Blowers, Lawrence, bushel small clover seed, 1st premium	5 00
Geo. W. Prescott, Grand Rapids, 2d premium	3 00
J. W. Blowers, Lawrence, bushel timothy seed, 1st premium	5 00
W. S. Penfield, Detroit, 2d premium	3 00
R. M. Webster, Armada, bushel buckwheat, first premium	3 00
Henry Bidwell, Plymouth, 2d premium	2 00
W. S. Penfield, Detroit, bushel flax seed, 1st premium	3 00
W. S. Penfield, Detroit, bushel red top grass seed, 1st premium	5 00
W. S. Penfield, Detroit, bushel blue top grass seed, 1st premium	5 00
Geo. H. Prescott, Grand Rapids, sample hops, 1st premium	2 00
R. M. Webster, Armada, 2d premium	1 00
David Woodman, Paw Paw, assortment of seeds for field crop, 1st premium	10 00
Detroit Seed Co., Detroit ... Diploma and	5 00
Geo. W. Prescott, Grand Rapids ... Diploma and	5 00
Detroit Seed Co, Detroit, kitchen garden seeds, 1st premium	10 00
David Woodman, Paw Paw, grain in heads, 1st premium	15 00
Geo. W. Prescott, Grand Rapids, 2d premium	5 00
Burlingt'n & Missouri R. R. Co., Nebraska, display of cereals, discretionary and	5 00
David Woodman, Paw Paw, bushel medium clover seed, discretionary and	2 00
David Woodman, Paw Paw, display corn in the ear, discretionery and	2 00
David Woodman, Paw Paw, display millets and grasses, discretionary and	2 00
David Woodman. Paw Paw, specimen California golden broom corn, discretionary and	2 00
David Woodman, Paw Paw, specimens pearl millet, discretionary and	2 00
David Woodman, Paw Paw, flax, discretionary and	2 00
John Spalding, Sault Ste Marie, display of cereals and garden vegetables from Chippewa county	Diploma.

The whole display in this class is very fine. Your committee have recommended a few discretionery premiums which, if allowed, we think will be to the mutual interest of the Society and exhibitors.

C. A. HARRISON,
D. J. BRIGGS,
D. WOLVERTON,
Committee.

CLASS 28—ROOTS AND VEGETABLES.

David Geddes, Saginaw City—six heads sunflower, 1st premium	$2 00
H. B. Chapman. Reading, 2d premium	1 00
A. Den Adel, Kalamazoo—six stems Swiss chard, 1st premium	2 00
C. Van Haaften. Kalamazoo, 2d premium	1 00
Henry C. Engle, Detroit—six stems parsley, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00

Henry C. Engel, Detroit—six stems spinach, 1st premium	$2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
Stephen Mark, Detroit—six stems sweet or pot herbs, 1st premium	2 00
A. Den Adel, Kalamazoo, 2d premium	1 00
A. Den Adel, Kalamazoo—collection sweet or pot herbs, 1st premium	3 00
C. Van Haaften, Kalamazoo, 2d premium	2 00
Geo. W. Prescott, Grand Rapids—six stem kohl rabi, 1st premium	2 00
A. Den Adel, Kalamazoo, 2d premium	1 00
Wm. Nowlen, Dearborn, black Spanish water melon, discretionary and	1 00

Your committee recommend a premium of $5.00 for collection of potatoes from Chippewa county, and $13.00 on roots to same county. We also recommend a premium of $5.00 to W. L. Walters for forty varieties of potatoes.

Your committee in submitting their report, have to say that they have found about three hundred articles entered as non-enumerated, all of which are very fine and worthy of special mention, but in justice to the Society, we have not recommended discretionary premiums for any article, and for the very good reason that we cannot decide that any are inferior, but all are fine, and should we give any premiums we must give to all. The whole display in this department is the finest we have ever seen, and clearly demonstrates that the farmers in this State are awake and alive to their best interests and are bound to make their department the most attractive part of the fair. The display of potatoes from the Agricultural College was very fair, and your committee recommend a premium of $5.00 and $10.00 for grasses.

N. M. PUGSLEY,
WM. MARKELLIS,
J. S. VANCROOK,
Committee.

David Geddes, Saginaw City, variety roots and vegetables, 1st premium	$12 00
C. M. Hubbell, Ypsilanti, 2d premium	10 00
C. Van Haaften, Kalamazoo, 3d premium	5 00
David Geddes, Saginaw City—three varieties early potatoes, 1st premium	3 00
Geo. W. Prescott, Grand Rapids, 2d premium	2 00
David Geddes, Saginaw City—three varieties late potatoes, 1st premium	3 00
C. Van Haaften, Kalamazoo, 2d premium	2 00
H. B. Chapman, Reading ... Discretionary and	1 00
W. L. Walters, Utica—peck early potatoes, 1st premium	3 00
Geo. W. Prescott, Grand Rapids, 2d premium	2 00
H. B. Chapman, Reading ... Discretionary and	1 00
L. C. Lincoln, Greenville ... Discretionary and	50
W. L. Walters, Utica—peck late potatoes, 1st premium	3 00
C. Van. Haaften, Kalamazoo, 2d premium	2 00
H. B. Chapman, Reading ... Discretionary and	1 00
C. M. Hubbell, Ypsilanti—peck sweet potatoes, 1st premium	3 00
H. B. Chapman, Reading, 2d premium	2 00
Henry C. Engel, Detroit—doz. blood beets, 1st premium	2 00
Geo. W. Prescott, Grand Rapids, 2d premium	1 00
Geo. W. Prescott, Grand Rapids—doz. turnip beets, 1st premium	2 00
A. Den Adel, Kalamazoo—2d premium	1 00
David Geddes, Saginaw City—doz. sugar beets, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
David Geddes, Saginaw City—doz. white or yellow beets, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
C. M. Hubbell, Ypsilanti—doz. table beets, 1st premium	2 00
David Geddes, Saginaw City, 2d premium	1 00
David Geddes, Saginaw City—collection 5 kinds beets, 1st premium	3 00
A. Den Adel, Kalamazoo, 2d premium	2 00
C. M. Hubbell, Ypsilanti--doz. mangel wurtzel, 1st premium	2 00
David Geddes, Saginaw City, 2d premium	1 00
David Geddes, Saginaw City—doz. orange carrots, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
David Geddes, Saginaw City—doz. white carrots, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
David Geddes, Saginaw City—doz. other varieties carrots, 1st premium	2 00
A Den Adel, Kalamazoo, 2d premium	1 00
David Geddes, Saginaw City—four kinds carrots, 1st premium	3 00
A. Den Adel, Kalamazoo, 2d premium	2 00

Geo. W. Prescott, Grand Rapids—doz. flat turnips, 1st premium	$2 00
David Geddes, Saginaw City, 2d premium	1 00
David Geddes, Saginaw City—doz. Swedes turnips, 1st premium	2 00
Stephen Mark, Detroit, 2d premium	1 00
C. Van Haaften, Kalamazoo—doz. other varieties turnips, 1st premium	2 00
Stephen Mark, Detroit, 2d premium	1 00
David Geddes, Saginaw City—doz. parsnips, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
David Geddes, Saginaw City—doz. salsify, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
C. Van Haaften, Kalamazoo—doz. winter radishes, 1st premium	1 00
A. Den Adel, Kalamazoo, 2d premium	1 00
David Geddes, Saginaw City—doz. summer radishes, 1st premium	2 00
W. L. Walters, Utica, 2d premium	1 00
David Geddes, Saginaw City—collection of radishes, 1st premium	3 00
C. Van Haaften, Kalamazoo, 2d premium	2 00
David Geddes, Saginaw City—variety of culinary vegetables, 1st premium	5 00
Geo. W. Prescott, Grand Rapids—2d premium	3 00
Geo. W. Prescott, Grand Rapids—four drumhead cabbages, 1st premium	2 00
John Spalding, Sault Ste. Marie, 2d premium	1 00
Geo. W. Prescott, Grand Rapids—four conehead cabbages, 1st premium	2 00
David Geddes, Saginaw City, second premium	1 00
C. Van Haaften, Kalamazoo—four savoy cabbages, 1st premium	2 00
A. Den Adel, Kalamazoo, 2d premium	1 00
C. Van Haaften, Kalamazoo—four red cabbages, 1st premium	2 00
A. Den Adel, Kalamazoo. 2d premium	1 00
David Geddes, Saginaw City—collection five kinds cabbages, 1st premium	3 00
A. Den Adel. Kalamazoo, 2d premium	2 00
Stephen Mark, Detroit—four kinds cauliflower, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
A. Den Adel, Kalamazoo—six heads lettuce, 1st premium	2 00
David Geddes. Saginaw City, 2d premium	1 00
Henry C. Engel, Detroit—six bunches kale, 1st premium	2 00
A. Den Adel, Kalamazoo, 2d premium	1 00
A. Den Adel, Kalamazoo—doz. stems celery, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
David Geddes, Saginaw City—doz. stems rhubarb, 1st premium	2 00
Charles Lerchen, Greenfield, 2d premium	1 00
Stephen Mark, Detroit—half doz. vegetable eggs, 1st premium	2 00
John Ford & Son, Detroit, 2d premium	1 00
C. M. Hubbell, Ypsilanti—doz. peppers, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	2 00
Geo. W. Prescott, Grand Rapids—three varieties tomatoes, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
Stephen Mark, Detroit—peck other tomatoes, 1st premium	2 00
Henry C. Engel, Detroit, 2d premium	1 00
C. M. Hubbell, Ypsilanti—peck white onions, 1st premium	2 00
Stephen Mark, Detroit, 2d premium	1 00
David Geddes, Saginaw City—peck red onions, 1st premium	2 00
Geo. W. Prescott, Grand Rapids, 2d premium	1 00
C. Van Haaften, Kalamazoo, peck yellow onions, 1st premium	2 00
David Geddes, Saginaw City, 2d premium	1 00
C. Van Haaften, Kalamazoo—collection 5 or more kinds onions, 1st premium	3 00
A. Den Adel, Kalamazoo, 2d premium	2 00
David Geddes, Saginaw City—five summer squashes, 1st premium	2 00
Stephen Mark, Detroit, 2d premium	1 00
David Geddes, Saginaw City—five marrow squashes, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
Stephen Mark, Detroit—five Hubbard squashes, 1st premium	2 00
A. Den Adel, Kalamazoo, 2d premium	1 00
C. M. Hubbell. Ypsilanti—single squash, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
David Geddes, Saginaw City—four or more kinds squash, 1st premium	3 00
C. M. Hubbell, Ypsilanti, 2d premium	2 00
Stephen Mark, Detroit—two field pumpkins, 1st premium	2 00
Geo. W. Prescott, Grand Rapids, 2d premium	1 00

C. M. Hubbell, Ypsilanti—three water melons, 1st premium	$2 00
Wm. Nowlin, Dearborn, 2d premium	1 00
Stephen Mark, Detroit—three musk melons, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
C. M. Hubbell, Ypsilanti—three nutmeg melons, 1st premium	2 00
John Ford & Son, Detroit, 2d premium	1 00
C. M. Hubbell, Ypsilanti—three citrons, 1st premium	2 00
David Geddes, Saginaw City, 2d premium	1 00
C. M. Hubbell, Ypsilanti—collections of melons, 1st premium	3 00
C. Van Haaften, Kalamazoo, 2d premium	2 00
Geo. W. Prescott, Grand Rapids—five cucumbers, 1st premium	2 00
W. L. Walters, Utica, 2d premium	1 00
C. Van Haaften, Kalamazoo—sample mohawk beans, 2d premium	1 00
A. Den Adel, Kalamazoo—half peck lima beans, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
A. Den Adel, Kalamazoo—half peck bush beans, 1st premium	2 00
C. Van Haaften, Kalamazoo, 2d premium	1 00
A. Den Adel, Kalamazoo—half peck wax beans, 1st premium	2 00
David Geddes, Saginaw City, 2d premium	1 00
C. Van Haaften, Kalamazoo—collection 3 kinds garden beans, 1st premium	3 00
A. Den Adel, Kalamazoo, 2d premium	2 00
C. Van Haaften, Kalamazoo—doz. ears sweet corn, 1st premium	2 00
Geo. W. Prescott, Grand Rapids, 2d premium	1 00
C. M. Hubbell, Ypsilanti—doz. ears late sweet corn, 1st premium	2 00
Stephen Mark, Detroit, 2d premium	1 00
Geo. W. Prescott, Grand Rapids—doz. ears pop corn, 1st premium	2 00
C. M. Hubbell, Ypsilanti, 2d premium	1 00
R. M. Webster, Armada, discretionary and	50

CLASS 29.—FLOUR, MEAL AND FEED.

A. Lauhoff, Detroit—barrel flour, 1st premium	$5 00
R. M. Webster, Armada—sample buckwheat flour, 1st premium	2 00
E. D. Tilson, Tilsonburg—sample oat meal and flour, 1st premium	2 00

C. A. HARRISON,
D. J. BRIGGS,
D. WOLVERTON,
Committee.

CLASS 30.—BUTTER AND CHEESE.

Mrs. W. T. Lewis, Pontiac—25 lbs. domestic butter, 1st premium	$16 00
A. Bailey, Big Beaver, 2d premium	12 00
R. M. Webster, Armada, 3d premium	8 00
Mrs. H. Walton, Pontiac, 4th premium	4 00
A. Bailey, Big Beaver—10 lbs. domestic butter, 1st premium	8 00
J. G. English, Detroit, 2d premium	6 00
Mrs. R. Stage, Pontiac, 3d premium	4 00
Mrs. H. Walton, Pontiac, 4th premium	2 00
Mrs. W. Lincoln, Greenville—best display of domestic cheese, 1st premium	10 00
John McDonald, Yuba, 2d premium	8 00
A. D. Power, Farmington—display of cheese by any factory, 1st premium	25 00
A. B. Smith, Farmington, 2d premium	20 00
S. D. Morrell, Charlotte, 3d premium	15 00
John Elliott, Iosco, 4th premium	10 00
H. S. Day & Smith, Ypsilanti, 5th premium	5 00
Jacob Beller, Detroit—sample imported Swiss cheese	Diploma.
Jacob Beller, Detroit, discretionary	3 00
Mrs. S. F. Lerich, Utica—sample Dutch cheese, discretionary	1 00
Mrs. S. F. Lerich. Utica—sample cottage cheese, discretionary	1 00
J. E. Chamberlain, Farmington—sample old cheese, discretionary	2 00

A. Bailey, Big Beaver—jar domestic butter, special. A lady's patent rocker, offered by Kirchburg, Winterhalter & Keenan.

Your Committee are thoroughly convinced that the State of Michigan is second to no State in the Union for butter and cheese. We have found the samples on exhibition all good, and only regret that we cannot award them all premiums.

(Signed.) C. A. HARRISON, *Ch'n.*
D. J. BRIGGS.
D. WOLVERTON.

CLASS 31.—SUGAR, HONEY, AND BEE HIVES.

J. S. Forncrook & Co., Detroit, gallon maple syrup, 1st premium	$3 00
M. Green, Farmington, 2d premium	2 00
D. L. Garver, Saginaw City, 10 lbs. maple sugar, 1st premium	5 00
Mrs. R. M. Cook, Charlotte, 2d premium	3 00
Frank Benton, Detroit, sample of honey in boxes, 1st premium	3 00
H. D. Cutting, Clinton, 2d premium	2 00
Wm. Spedding, Rockwood, dis	3 00
Henry Bidwell, Plymouth, dis	3 00
H. D. Cutting, Clinton, bee hive, 1st premium	5 00
Frank Benton, Detroit, 2d premium	3 00
Frank Benton, Detroit, colony Italian bees, dis	2 00
Frank Benton, Detroit, nucleus hive exhibiting Italian queen bee, dis	1 00
Frank Benton, Detroit, honey extractor, with honey knife, dis	1 00
Frank Benton, Detroit, bee smoker, dis	1 00
Frank Benton, Detroit, bee veil for protection from stings, dis	1 00
Frank Benton, Detroit, specimen artificial comb foundation, dis	1 00
Frank Benton, Detroit, cages for introducing Italian queen bees into hives, dis	1 00
W. H. Edgar & Son, loaf of refined sugar, dis	1 00

Your committee in submitting their report in this class desire to make particular mention of exhibits numbered 126 to 134 inclusive, by Frank Benton, of Detroit, all of which (except 132) must be of great practical use to all engaged in the bee business. We recommend a small discretionary premium, but suggest that instead of the premiums a diploma be given for each article. The honey is all good, and it has been a difficult matter for us to decide which is the best. Our first decision on maple sugar was for No. 114 for first premium, but under instructions from the superintendent of this division, we have changed it to No. 766. The maple syrups are all good, and are worthy of special mention.

C. A. HARRISON, *Ch'n.*
D. J. BRIGGS.
D. WOLVERTON.

CLASS 32.—BREAD AND PICKLES.

Charles Richard, Detroit, three loaves of baker's bread, 1st premium	$3 00
Mrs. S. F. Lerich, Utica, three loaves salt rising bread, 2d premium	2 00
Mrs. R. Stage, Pontiac, three loaves salt rising bread, 1st premium	3 00
Mrs. J. A. Williams, Detroit, three loaves yeast bread, 1st premium	3 00
Miss Kitty Stowe, Detroit, three loaves yeast, 2d premium	2 00
Mrs. Mary Peacock, Pontiac, sample soda bread, 1st premium	3 00
Mrs. R. Stage, Pontiac, sample soda bread, 2d premium	2 00
Mrs. R. Stage, Pontiac, sample corn bread, 1st premium	3 00
H. B. Chapman, Reading, 2d premium	1 00
H. B. Chapman, Reading, three loaves brown bread, 1st premium	3 00
Eva Swan, Detroit, sample flour bread, 1st premium	3 00
Lewis & Sykes, Detroit, display of crackers, 1st premium	3 00
Geo. W. Prescott, Grand Rapids, display of pickled vegetables, 1st premium,	5 00
L. C. Lincoln, Greenville, 2d premium	3 00
Mrs. R. M. Cook, Charlotte, fruit cake, discretionary,	1 00
Mrs. R. M. Cook, Charlotte, one doz. doughnuts, discretionary,	1 00
Mrs. R. M. Cook, Charlotte, one doz. cookies, discretionary,	1 00
Clark Bros., Detroit, cream crackers	Diploma
Chene Bros., Detroit, jar pickles, discretionary,	1 00
Chas. Richard, Detroit, doz. Vienna rolls, discretionary	1 00
Chas. Richard, Detroit, doz. caramels, discretionary	1 00
Vail & Crain, Detroit, display of crackers and sweet goods	Diploma
L. C. Lincoln, Greenville, sample canned peas, discretionary,	1 00
L. C. Lincoln, Greenville, sample canned corn, discretionary	1 00
L. C. Lincoln, Greenville, sample dried beans, discretionary,	1 00

The display of crackers and sweet goods made by Vail & Crane, Clarke Bros. and Lewis & Sykes, of Detroit, is very fine, and has added greatly to the attractions of the Fair.

We have found that all the articles in this class are first-class, and have, therefore, recommended several discretionary awards.

(Signed.)

C. A. HARRISON, *Ch'n.*
D. J. BRIGGS.
D. WOLVERTON.

CLASS 33.—TOILET ARTICLES, PREPARED GROCERIES, ETC.

Fred Sanders, Detroit, display of confectionary, discretionary and	$3 00
John Davis, West Bay City, display flavoring extracts	Diploma
J. A. Williams & Co., Detroit, display toilet soaps, discretionary and	1 00
Johnson & Wheeler, Detroit, display washing soaps, discretionary and	2 00
Johnson & Wheeler, Detroit, display ground spices	Diploma
Frank Inglis, Detroit, display flavoring extracts, discretionary and	3 00
Joseph Beedzler, Detroit, display confectionery	Diploma
C. C. Warren & Co., Toledo, Ohio, samples of manufactured groceries	Diploma
Albert B. Lee & Co., display of confectionery and pop corn, discretionary and	3 00

Your committee, in submitting their report in this class, desire to make special mention of the very fine display of groceries, canned fruits, extracts, made by Hull Bros. and J. A. Williams & Co., of Detroit, and C. C. Warren & Co., of Toledo, Ohio; of extracts by John Davis, of West Bay City, and Frank Inglis and Edward D. Meder, of Detroit; of confectionary, by Joseph Beedzler, Albert B. Lee & Co. and Fred Saunders, of Detroit, and of washing soaps, extracts and spices by Johnson & Wheeler, of Detroit, and Schultz & Co. and Gillett, McCulloch & Co., of Zanesville, Ohio, and Chicago, Illinois.

C. A. HARRISON,
D. J. BRIGGS,
D. WOLVERTON,
Committee.

CLASS 34.—MISCELLANEOUS.

Twin Brothers, Detroit, samples of yeast	Diploma
John Davis, West Bay City, samples of baking powder, discretionary	$2 00
John Davis, West Bay City, samples of saleratus, discretionary	2 00
Schultz & Co. and Gillett, McCulloch & Co., Zanesville, Ohio and Chicago, Il., samples of cream yeast, discretionary	2 00
Judd Brothers, Detroit, samples of dry hop yeast, discretionary	2 00
Edward D. Meder, Detroit, display of baking powder, discretionary	2 00
James A. Parent & Co., Detroit, display of baking powder	Diploma
Capitol Yeast Co., Lansing, display of yeast, cakes, discretionary	2 00
James Sheldon, sample Yerba Buena bitters, discretionary	1 00
Charles B. Stevens, Detroit, sample white pine chewing gum, discretionary,	2 00
J. A. Williams & Co., Detroit, display of foreign and domestic fruits	Diploma
J. A. Williams & Co., Detroit, display of teas and coffees	Diploma
Hull Brothers, Detroit, sample of prepared groceries	Diploma
East India Brewing Co., Detroit, sample of ale and porter, discretionary	3 00
East India Brewing Co., Detroit, sample of hop tonic	Diploma
Hermann Schaale, Detroit, variety of sausage	Diploma

In this class your committee have found all the articles meritorious, and have therefore recommended a number of discretionary awards.

C. A. HARRISON,
D. J. BRIGGS,
D. WOLVERTON,
Committee.

DIVISION G.

CLASS 35.—PLOWS.

Best plow for turning sod land or green sward—Gales Manufacturing Co., Albion, Mich.	$5 00
Best plow for turning under stubble—Furst, Bradley & Co., Chicago, Ill.	5 00
Best plow for general use made in Michigan—Bement & Sons, Lansing, Mich.,	15 00
Best plow for general use made in any other State—South Bend Chilled Plow Co., South Bend, Ind.	10 00
Best heavy plow for new land—Wiard Plow Co., Detroit .... Diploma and	5 00
Best attachment for any plow for covering grass or long manure—South Bend Chilled Plow Co., South Bend, Ind.	5 00
Best subsoil plow—Wiard Plow Co. .... Diploma and	5 00
Self-cleaning plow coulter—Gale Manufacturing Co., Albion	1 00
Best gang plow—Richardson, McInnes & Co., Grand Rapids	5 00
Largest and best display of plows exhibited by manufacturers—Gale Manufacturing Co., Albion, Mich., 1st premium	50 00

Wiard Plow Co., 2d premium	$25 00
Bement & Sons, Lansing, 3d premium	15 00
Jointer plow—Wiard Plow Co., discretionary	1 00
One-horse plow—Wiard Plow Co., discretionary	1 00
Wrought frame sulky plows—Furst, Bradley & Co., discretionary	2 00
Samples of chilled plows—Gale Manufacturing Co., Albion, discretionary	2 00
Reversible steel plow point—N. G. Pinney, New Hudson, discretionary	1 00
One swivel plow for level lands—W. S. Penfield, Detroit, discretionary	1 00
Sulky plow attachment—P. P. Mast & Co., Springfield, Ohio	1 00
One sulky plow—Gale Manufacturing Co., Albion, discretionary	2 00
One corn plow—M. Limback, Detroit, discretionary	1 00
One three-horse equalizer for plows—J. C. Blumer, Kalamazoo, discretionary,	1 00

MILTON J. GARD,
SAMUEL CADY,
B. B. MOSHER,
Committee.

CLASS 36.—TILLAGE INSTRUMENTS.

Best field roller—O. A. Smith, Birmingham	$5 00
Best harrow for general use—W. S. Penfield, Detroit	5 00
Best iron harrow—Polly & Wherry, Plymouth	3 00
Best wooden harrow, Mitchell Bros., Oxford	3 00
Best one-horse cultivator—Bement & Sons, Lansing	3 00
Best display of cultivators exhibited by manufacturers—Robbins' Cultivator Co., Jackson, 1st premium	50 00
P. P. Mast & Co., Springfield, Ohio, 2d premium	25 00
Bement & Sons, Lansing, 3d premium	10 00
Best machine for hoeing and weeding drills in garden—W. S. Penfield, Detroit	2 00
Combined riding or walking cultivator with fifth shovel—Furst & Bradley, Chicago, Ill., discretionary	3 00
Seeder attachment, Emerson—Tolcott & Co.. Rockford, Illinois, discretionary	5 00
Two-horse cultivator—Frank H. Satter & Co., Battle Creek, discretionary	3 00
Combined field roller and plaster sower and seeder—Fitzsimmons & Co., Reading, discretionary	2 00
Tongueless cultivator—J. H. Jones, Allegan, discretionary	3 00
Sulky cultivator—Emerson, Tolcott, & Co., Rockford, Ill., discretionary	2 00
Two-horse corn cultivator—Long, Ollslatter & Co., Grand Rapids, discretionary	2 00
Wheat hoe—A. B. Travis, Brandon, discretionary	5 00
Corn and fallow cultivator—A. B. Travis, Brandon, discretionary	2 00
Standard walking cultivator—Emerson, Talcott & Co., Rockford, Ill., discretionary	2 00

DEXTER WHITE, Northville,
A. G. GATES, Otsego,
JOSEPH CLAYTON,
Committee.

CLASS 37.—SEED-DRILLS, PLANTERS, SOWERS, ETC.

Best two-horse seed drill—"Farmer's Friend," W. S. Penfield, Detroit, 1st premium	25 00
P. P. Mast & Co., 2d premium	15 00
Best two-horse broad-cast seeder for grain—D. G. McSherry, Dayton, Ohio	20 00
Robbins' Cultivator Co., Jackson, 2d premium	10 00
Best ashes and plaster sower, horse power—Geo. H. Fowler, Detroit, 1st premium	5 00
Best corn or bean planter, horse power—Emerson, Tolcott & Co., Rockford, Ill.	5 00
Drill for sewing seeds of root crops by hand—W. S. Penfield, Detroit, 1st premium	1 00
Best hand corn planter, Remington & Co., 1st premium	1 00
W. S. Penfield, Detroit, 2d premium	50
An attachment to seed drill, discretionary	silver medal
A fertilizer attachment to drill	silver medal

A. B. GULLEY, Dearborn.
L. RIGGS, Belleville.
JOHN KIRBY, Volinia,
Committee.

CLASS 38.—AGRICULTURAL IMPLEMENTS.

Best horse hay rake—Ithaca Agricultural Works, Chicago, Ill., 1st premium.. $15 00
W. S. Penfield, Detroit, 2d premium.......... 10 00
P. A. Spicer, Marshall, 3d premium.......... 5 00
Machine for mowing lawns by hand—"Philadelphia," E. T. Barnum, 1st premium.......... 1 00
One bar potato digger—W. S. Penfield, discretionary.......... 1 00
Hay press—P. K. Diederick, Albany, N. Y..........silver medal
Hay tedder—W. S. Penfield, Detroit, 1st premium discretionary.......... 2 00
James M. Hill, Ann Arbor, 2d premium, discretionary.......... 1 00

We, the following committee, after carefully examining above articles, have made the report as above.

C. M. SLY, Plymouth,
WILLIAM FRENCH, Sanilac,
PETER SWARTZ, Sanilac,
Committee.

CLASS 39.—APPARATUS AND MACHINES CONNECTED WITH THE CLEANING AND PREPARATION OF CROPS FOR MARKET AND FOR THE FEEDING OF STOCK.

Best horse power for farm use—Nichols, Shepard & Co., Battle Creek, 1st premium.......... $20 00
Battle Creek Machinery Co., Battle Creek, 2d premium.......... 15 00
Greatest variety and best display of feed cutters—Eagle Machine Co., Lancaster, Ohio, 1st premium.......... 15 00
David Lawton, Racine, Wis., 2d premium.......... 10 00
Best corn sheller—W. S. Penfield, Detroit, 1st premium.......... 2 00
Best fanning mill—Henry Cortrite, Lansing, 1st premium.......... 5 00
Best straw and stalk cutter for hand power—W. S. Penfield, Detroit, 1st premium.......... 3 00
Best machine for pulling roots—David Lawton, Racine, Wis., 1st premium... 5 00
Best contrivance for steaming for cattle, for over twenty head—F. E. Mills, Ann Arbor.......... 5 00
Best portable cider mill, P. P. Mast & Co, Springfield, Ohio.......... 2 00
Best portable steam engine, to be used for agricultural purposes—E. M. Birdsall, Penn Yan, N. Y..........Diploma and 2 00
Best portable grist mill—W. S. Penfield, Detroit, 1st premium.......... 5 00
Best portable steam traction engine for farm use, discretionary..........Silver Medal.

O. R. PATTENGILL, Plymouth,
A. J. FOSTER, Granger,
M. R. STRONG, Belleville,
L. S. COWLES, 56 North Ashland ave, Chicago,
Committee.

CLASS 40.—MISCELLANEOUS FARM ARTICLES.

Best drag sawing machine—Battle Creek Machinery Co.,.......... $20 00
Best circle sawing machine—Battle Creek Machinery Co.,.......... 15 00
Best stump puller capable of lifting ten tons—J. B. Thorne, Hillsdale, 1st premium.......... 10 00
Linden & Dunneback, Lansing, 2d premium.......... 5 00
Lusk & Co., Jackson, 3d premium.......... 3 00
Best display of farming hand tools—Remington Agricultural Works, Ill..... 20 00
Best road scraper—A. Maybee, Maybe, Monroe county, 1st premium.......... 2 00
W. S. Penfield, Detroit, 2d premium.......... 1 00
M. Limbach, Detroit, 3d premium.......... 50
Display of shovels and spades—Remington Agricultural Works, Ilion, N. Y., 1st premium.......... 5 00
Grindstone with hangings—J. M. Sterling, Monroe, 1st premium.......... 2 00
Fruit ladder—W. S. Penfield, Detroit, 1st premium.......... 1 00
Hand pump for wells—Mast, Foos & Co., Springfield, Ohio, 1st premium..... 2 00
Pump and filter combined—J. Bean & Son, Springfield, Ohio, 1st premium.. 2 00
Cistern Pump—W. S. Needles, Barrettstown, Ohio, 1st premium.......... 1 00
Farm gate—M. W. Tucker, Sumner, 1st premium.......... 1 00
Farm fence—John Morton, Thamesville, 1st premium.......... 1 00
A. N. Smith, Detroit, 2d premium.......... 50
Pitching apparatus—Ira S. Gardiner, Johnsons, Orange Co., N. Y. 1st premium, discretionary.......... 2 00

Combined bag holder and truck—Frisbie & Hamilton, Monroe, 1st premium, discretionary	$1 00
One set three-horse whiffletrees—Mitchell & Bro., Oxford, discretionary	1 00
Best display of farm implements—Bennett & Sons, Lansing, discretionary	1 00
Atmospheric Press—John Clark, Pontiac, discretionary	1 00
One stone boat—W. Gregg, Mason, discretionary	1 00
One pomace holder—John Clark, Pontiac, discretionary	1 00
Display fermenting taps—John Clark, Pontiac. discretionary	50
Display apple parers—D. H. Whittemore, Worcester, Mass.	2 00
Adjustable platform and steps—Chas. Parkinson, Coldwater, discretionary	1 00
King's patent frame erector—S. R. King, Mason	Silver Medal.
Tubular well and pump—Tubular Well Co., Kalamazoo	2 00
Automatic farm gate—J. E. Strong, Yorkville, Ont.	3 00
Farm gate and hangings—J. Baumgarten, Frazer, discretionary	1 00
D. C. Farrington, Ovid, discretionary	1 00

JOHN J. ROBINSON, Manchester.
M. WING, Augusta.

CLASS 41.—DAIRY AND HOUSEHOLD ARTICLES.

Best churn for making butter—Dairy Queen M'f'g Co., Bay City, 1st premium	$1 00
Best milk pans with cooler—Stellwagon & Rynock, Plymouth	2 00
Best milk strainer—W. J. G. Dean, Hanover	1 00
Milk safe—E. T. Barnum, Detroit, 1st premium	1 00
Best dozen brooms—Detroit Broom Co., 1st premium	1 00
Six mops and handles—W. N. Cook, Grand Rapids	1 00
Best washing-machine—G. F. Burtch, Jackson	2 00
Clothes wringing machine—Colby Wringer Co., Waterbury, Vt	1 00
Best fruit dryer—A. McPherson & Co., Detroit	5 00
Best cheese safe—J. Forncrook, Scott & Co., Detroit	1 00
Best corn popper—E. T. Barnum & Co., Detroit	1 00
Best machine for working butter—W. J. G. Dean, Hanover	1 00
Display of brooms—Detroit Broom Co., discretionary	3 00
Fruit dryer for family use—Lyons & Clark, Armada, discretionary	3 00
N. O. Cooley, patent creamer—W. J. G. Dean, Hanover, discretionary silver medal	
Vegetable washing-machine—C. B. Hutchins, Ann Arbor, discretionary	1 00
Fluting machine—G. W. Bissell, Detroit, discretionary	50c
Tack hammer—L. Granger, Armada, discretionary	1 00
Carpet sweeper, "Ladies Friend,"—Charles Cone, Goshen, Ind., discretionary	1 00
One pot cover—Mrs. C. G. Hampton, Detroit, discretionary	50c
Iron board and clothes rack combined—H. C. Woodworth, Otisville, discretionary	2 00
Double ironing board and clothes rack—H. C. Woodworth, Otisville, discretionary	2 00

Your committee on articles in Division G, Class 41, have finished their labors. We have used a good deal of care with regard to awarding premiums, and have intended to do fair justice to all.

F. S. FINLEY,
J. C. MARKLE,
MR. CATOR,
Committee.

H. O. HANFORD,
ABEL ANGEL,
Superintendents.

The superintendents in Division G. make the following report on discretionary premiums:

DIVISION G.

CLASS 35.

No.		
8	Jointer, discretionary	$1 00
10	One-horse plow, discretionary	1 00
15	Wrought frame sulky plow, discretionary	2 00
36	Sample of chilled iron for plow castings, discretionary	2 00
94	Reversible steel plow point, discretionary	1 00

No.		
205	One swivel plow for level land, discretionary	$1 00
244	Sulky plow attachment, discretionary	1 00
335	Sulky plow, discretionary	2 00
411	Corn plow, "A" 00 steel, discretionary	1 00
426	One three-horse equalizer, discretionary	1 00

CLASS 36.

16	One combined riding or walking cultivator (with fifth shovel) discretionary	$3 00
63	Seeder attachment to cultivator, discretionary	3 00
315	One two-horse cultivator, discretionary	3 00
375	One combined field roller and plaster sower and seeder, discretionary	2 00
380	Two tongueless cultivators, discretionary	3 00
287	One wheat hoe, discretionary	5 00
288	Corn and fallow cultivator, discretionary	2 00
289	Standard walking cultivator, discretionary	2 00
389	Sulky cultivator, discretionary	2 00
409	Two-horse corn cultivator, discretionary	2 00

CLASS 37.

209	An attachment to seed drill	Silver Medal
473	Fertilizer attachment to drill	Two Silver Medals

CLASS 38.

194	One bar potato digger, discretionary	$1 00
179	One hay feeder, 1st discretionary	2 00
372	One hay feeder, 2d discretionary	1 00

CLASS 39.

362	One portable steam traction engine for farm uses	Silver Medal

CLASS 40.

347	One tubular mill and pump, discretionary	$2 00
44	One automatic entrance farm gate, discretionary	3 00
165	Farm gate and hangings, discretionary	1 00
166	Farm gate and hangings, 2d discretionary	1 00
172	One pitching apparatus, discretionary	2 00
221	Bag holder and truck, discretionary	1 00
252	Set three-horse whiffletrees, discretionary	1 00
309	One atmospheric press, discretionary	1 00
311	One pomace holder, discretionary	1 00
312	Display of fermenting taps, discretionary	0 50
336	One stone boat, discretionary	1 00
397	Display of apple and potato parers and slicers, discretionary	2 00
410	One adjustable platform and steps, discretionary	1 00
476	King's patent frame erector	Silver Medal

CLASS 41.

133	One set milk pans, and cooler, discretionary	$2 00
468	Detroit Broom Co.'s display of brooms, discretionary	3 00
303	One fruit dryer for family use, discretionary	3 00
105	One Cooley's patent creamer, No. 0 silver medal	
114	One vegetable washing machine, discretionary	1 00
123	One fluting machine, discretionary	50
136	One tack hammer, discretionary	1 00
230	One carpet sweeper, (lady's friend,) discretionary	1 00
200	One pot cover, discretionary	50
384	One ironing board and clothes rack combined, discretionary	2 00
385	One double ironing board and clothes rack combined	Silver Medal

H. C. HANFORD.
ABEL ANGEL.

DIVISION II.

CLASS 42.—WAGONS AND CARRIAGES.

Best two string phaeton—Hugh C. Gray & Co., Romeo, 2d premium	$3 00
Best three spring phaeton—Hugh C. Gray & Co., Romeo, 1st premium	6 00

Best top buggy—Sieves & Erdmar, Detroit, 1st premium	$6 00
J. W. Hewett & Son, Jackson, 2d premium	3 00
Buggy without top—J. W. Hewett & Son, Jackson, 1st premium	6 00
Sievers & Erdman, Detroit, 2d premium	3 00
Trotting wagon—J. W. Hewett & Son, Jackson, 1st premium	6 00
Tro.ting sulky—J. W. Hewett & Son, Jackson, 1st premium	6 00
Farm wagon for all purposes—Austin, Tomlinson and Webster Manufacturing Co., 1st premium	10 00
Linden Wagon Works, 2d premium	5 00
Spring wagon for market—S. M. Fangboner, Mt. Vernon, 1st premium	10 00
S. M. Fangboner, Mt. Vernon, 2d premium	5 00
Single sleigh and cutter—Sievers & Erdman, Detroit, 1st premium	5 00
Hugh Johnson, Detroit, 2d premium	3 00
Single farm wagon—Austin, Tomlinson and Webster Manufacturing Co., 1st premium	5 00
H. C. Gray & Co., Romeo, 2d premium	3 00
Dray truck wagon—S. Sievert & Son, Detroit	Diploma
Trucks for lumbering purposes—Richard Lara, Detroit, 1st premium	3 00
Best display of vehicles—Sievers & Erdman, Detroit, 1st premium	20 00
Austin Tomlinson and Webster Manufacturing Co., 2d premium	10 00
Six passenger rockaway—Thurt & Lutz, Detroit	Discretionary diploma
Phaeton buggy—Thurt & Lutz, Detroit, discretionary, 1st premium	6 00
Hearse—C. R. & J. C. Wilson, Detroit, discretionary	10 00
Shifting seat carriage body—John Kemp, Detroit, discretionary	2 00
Platform wagons with improved gearing—J. Beach & Son, Linden	Diploma
Carriage jacks—H. Sell & Son. Port Huron	1 00
Adjustable carriage tops—Fockley & Bro., Dubuque, Iowa	Diploma

A. H. BEACH,
P. B. RICHARDSON,
C. R. SELDEN,
Committee.

DIVISION I.

CLASS 43.—MACHINERY.

H. P. Portable Engine—G. S. Wormer & Sons, 1st premium	Silver Medal
Twenty-six swing-back geared drill—G. S. Wormer & Sons, 1st premium	Diploma
Portable forge and hand blowers—Buffalo Forge Co	Diploma
No. 8 rivet heating forge and dome, for utility for the purpose designed—G. S. Wormer & Sons	Silver Medal
Self-oilers for machinery—H. McGraw's pivot feed cup, 1st premium	Diploma
The "A" premium journal oilers (glass), special premium for the Yoke Spindle in this lubricator—Galvin Bros	Diploma
Lubricator, American self-oiler—Committee recommend silver medal for simplicity of design and excellence of workmanship and efficiency, 1st diploma	Silver Medal
Engine governors—G. S. Wormer & Sons, 1st premium	Medal
Patent safety valve—Case & Baillie, Detroit	Diploma
The national steam tube cleaner—G. S. Wormer & Sons, 1st premium	Medal

There were two fine exhibits in the class of Saws, one by H. & P. Mellus, and one by Welch & Griffith. The committee decline to make any award on circular saws from a mere inspection of those entered, without time or facilities for testing this class offered by the society. We recommend that it withhold the premiums.

For the best display of saws, we recommend the first premium to be awarded to R. B. Ridgely, of Detroit, representing Welch & Griffith.	
Two saw-gumming machines—S. P. Olney, Detroit, Mich., 1st premium	Diploma
Power scroll sawing machine—G. S. Wormer & Sons, 1st premium	Diploma
Leather belting—G. S. Wormer & Sons, for special excellence, committee awards	Silver Medal
For best display of stave and heading machinery—G. S. Wormer & Sons. Committee recommend 1st premium of	$10 00
Stave cutter—G. S. Wormer & Sons, 1st premium. Committee recommend a	Medal
Nine-inch cigar box plainer—G. S. Wormer & Sons for special value	Medal
Six-inch four-side molding machine—G. S. Wormer & Sons, for new and useful improvements	Diploma.

Paneling and variety molding machine—A. E. Leavitt, Detroit. Committee recommend a special premium of silver medal on this as a stave-working machine........Silver Medal
Stave foot jointer—G. S. Wormer & Sons........ Medal
Double and single blind-wiring machine—G. S. Wormer & Sons........ Medal
Five-foot heading jointer—G. S. Wormer & Sons........Diploma
Foot-power lathe—Battle Creek Manufacturing Co. For originality of design, committee recommends........Silver Medal
Seven-inch back-geared screw-cutting lathes—G. S. Wormer & Sons, 2d premium........Diploma

In the class of brick and tile machines, the committee recommend that no award be made for the want of time and facilities for making accurate mechanical tests of the power required, capacity and cost of product in the several exhibits. But, in our opinion the brick from machine entered under No. 432 are the best and most perfect. The machine itself is more than five years in public use, and consequently, under the rule may not be entitled to an award. The exhibitor claims that it has been perfected in its construction by the substitution of steel for iron in the working parts. As a matter of opinion, we consider No. 432 (Penfield's) the best machine.

In the general class of printing presses, the committee not being conversant with printing machinery, decline to make awards, but for the air-cushions and other points of excellence in the mechanical construction of the Cottrell & Babcock steam power press, they recommend it for......Silver Medal
Bit stock drills—G. S. Wormer & Sons........Diploma
Bit-point drills—G. S. Wormer & Sons (special)........ Medal
Automatic knife-grinding machine—G. S. Wormer & Sons, 1st premium........ $5 00
Planer-knife grinding machine—G. S. Wormer & Sons, 2d premium........ 3 00
Display of morticing chisels—G. S. Wormer & Sons, for the style called Ragged Edge........Diploma
Display of emery wheels and machines—Detroit Emery Wheel Company. Committee recommend silver medal for the wire filled wheel, for preventing bursting under high speed, medal and........ 5 00
For best display of steam pumps—Dixon direct-acting, Ottawa Iron Works, Ferrysburg, Mich., and for three new and valuable improvements, the committee awards a silver medal on same, to Wm. M. Ferry, of Grand Haven.
For the second best display of steam pumps, committee awards it to G. S. Wormer & Sons, for their display of Blake pumps........ 10 00
Lath packing machine—C. S. Wormer & Sons, 1st premium........ 5 00
For the largest and best display of machinery—G. S. Wormer & Sons........ 75 00
For the second best display of machinery, the committee awards the second prize to Pingree & Smith of Detroit, for setting up a complete shoe-making establishment, full stocked with new, curious, ingenious and effective machinery........ 50 00
Locomotive jack screws—G. S. Wormer & Sons, 1st premium........ 2 00
Wheat scourer and polisher—D. M. Richardson, Detroit, for great value in wheat cleaning........Silver medal
Frinding-mill, or disintegrator, Mead & Co., Detroit, for great value and utility for general grinding purposes........Silver medal
Improved foot power—H. D. Cutting, Clinton, Lenawee county, Mich........Diploma
Combined sawing machine—H. D. Cutting, Clinton, Lenawee county, Mich., for original and useful construction of stand and table........Silver medal
Tomlinson's patent barrel—Hiram Walker & Sons. We recommend a special premium of silver medal for this cylindrical veneer-barrel, which, in our opinion, will eventually supersede the bilge-barrel, not only on account of its manifest superiority, but on account of its lesser cost as well..Silver medal
Steam, hydraulic and hand-power elevator—Middlebrook & Co., Detroit....Diploma
Acme paper cutter—Cornwells, Price & Co., Detroit, for self-clamping device, Diploma
Steam mitre-machine and brass rule cutter—Cornwells, Price & Co., Detroit, Diploma
Miniature locomotive and tender—J. Madison Case, Detroit; for accuracy of proportions and good workmanship........Diploma
Display of iron and brass manufactures—James Flower & Bros., Detroit, silver medal for the stop-valve entered in this collection, diploma and silver medal........
Machine for cutting and punching slate—E. R. Davis, Detroit; meritorious labor-saving invention........Diploma

Patent wedge hose coupling, Galvin Bros., Detroit. This exhibit and No. 1074, Division 1, Class 44, appear to be identical; the committee therefore decline to make any award.
Portable lawn fountain—Galvin Bros....Diploma
Beer and ale cocks—Galvin Bros....Diploma
Steam cocks—Galvin Bros....Diploma
Combination gauge stand—Galvin Bros....Diploma
Gauge cocks and bibbs—Galvin Bros....Diploma
Display of bronze and brass castings—Galvin Bros....Diploma
Display of silver and nickel plate—Galvin Bros....Diploma
Mechanics and amateurs fine tools—Wohnlich & Zabriskie, Detroit....Diploma
Bronze car-axle bearings—Fulton Iron and Engine Works, Detroit; for special value....Silver Medal
Miscellaneous saw-mill tools—Robert B. Ridgely, Detroit....Diploma
Kidder's slide-door hangings—E. J. Flumerfelt, Romeo, Mich....Diploma
Display of stone-cutter's tools—W. H. Anderson, Detroit....Diploma
Hancock inspirator—Philbrick, Christie & Co.; a new and valuable invention....Silver Medal
Display bolts and nuts—Michigan Bolt and Nut Works....Diploma
Granger's shaking grate—H. W. Ganger, Detroit; for special excellence of design....Silver Medal
Elastic roller composition—W. H. Ranney, Detroit....Diploma
Universal boring machine—G. S. Wormer & Sons....Diploma
Stave equalizer—G.S. Wormer & Sons; for new and useful improvements..Silver Medal
Barrel heaters—G. S. Wormer & Sons....Diploma
Steel pressure blowers—G. S. Wormer & Sons....Diploma
Planing mill exhauster—G. S. Wormer & Sons....Diploma
Gear cutter—G. S. Wormer & Sons....Diploma
Band saw machine—G. S. Wormer & Sons....Diploma
Display of coffee mills (grocers)—G. S. Wormer & Sons; for superior design and excellent work....Diploma
Lightning screw plates—G. S. Wormer & Sons....Diploma
Danbury drill chucks—G. S. Wormer & Sons....Diploma
Speed indicator—G. S. Wormer & Sons; for excellence....Silver Medal
Lace leather—G. S. Wormer & Sons....Diploma
Brass and iron gauge-cocks—G. S. Wormer & Sons....Diploma
Elevator buckets—G. S. Wormer & Sons; for special value....Silver Medal
Belt punches—G. S. Wormer & Sons....Diploma
Champion boot-leg turner—D. Bissell....Diploma
Jointer and equalizer springs—G. S. Wormer & Sons; new and valuable....Diploma
Green river No. 10 bolt cutter, mounted—G. S. Wormer & Sons.... Medal
Horse shoer's machine—G. S. Wormer & Sons....Diploma
Wood-shaper, two spindles—G. S. Wormer & Sons....Diploma
Cigar lighter plane—H. W. Yates, Detroit....Diploma
Controllable rake for reaper—James H. Lewis, Detroit....Diploma
Revolving window screen—J. C. Walker, Detroit....Diploma
Case for holding and cutting paper—David Campau, Detroit....Diploma
Display of horse shoes—Freeman & Dwinner, Flint, Mich.; for style and excellent workmanship....Diploma
Furnace grate bar—A. E. Bartlett, Detroit....Silver Medal

This bar gives more air per square foot of area than any other, being very light and short, they will not warp and are easily replaced at a small cost.

Window blind fastener—J. S. Buck, Detroit....Diploma
Display of stereotypes—Detroit Free Press Co....Diploma
Display of stereotype plates and cuts—Detroit Free Press Co....Diploma
Hot-rolled polished shafting—Fulton Iron and Engine Works, Detroit; new, cheap, good....Silver Medal
Printing office—Detroit Free Press Co....Diploma
Newspaper rack—J. W. Childs, Ypsilanti, Mich.; neat and convenient....Diploma
Tomlinson barrel machine—Hiram Walker, Detroit; simple, ingenious and effective, can be operated with cheap labor....Diploma
Lightning screw taps, lightning pipe taps, very superior articles, exhibitor unknown....Diploma
Yale vertical engine—G. S. Wormer & Sons, 2d....Diploma
For the best display of wood-working machinery, we award the 1st premium to G. S. Wormer & Sons.... $20 00

CLASS 44.

For the best new article for working wood—James H. Lewis, Detroit ... $5 00
Circulating radiator—McWilliams & Co., Detroit; for positive circulation with the least pressure ... Silver Medal
Steam damper regulator—D. C. Kellan, Detroit; a great fuel saver ... Silver Medal
Curve-scribe—Israel Kinney, Windsor, Ont. ... Diploma
No. 53 in Division K, transit attachment—H. C. Pearson, Ferrysburg, Mich., silver medal and ... $5 00

Considering the premium offered for best new article relating to astronomical or mathematical instruments in Class 44, for extraordinary utility, accuracy of work and perfection of workmanship, the committee awards the $5 premium offered and a silver medal, and would award a gold medal if permitted.

Grain binder—Morgan & Palmer, Howell, Mich.; for the best new article relating to agriculture ... $5 00
Cultivator blades—Robbins Cultivator Co., Jackson, Mich.; the reversible feature in this device doubles its durability ... Silver Medal
Hatchway-closer—Louis Pare, Detroit ... Diploma
Sash lock—Israel Kinney, Detroit ... Diploma
Sash fastener—Cyrus Kinney, Detroit ... Diploma
Door lock—Cyrus Kinney, Detroit ... Diploma
Railway track cleaner—Augustus Day, Detroit ... Diploma
Snow-plow and supplementary cleaners—Augustus Day, Detroit; for special value and utility ... Silver Medal
Sash balance and fastener—H. Tenwinkle, Detroit ... Diploma
Door knobs—E. L. Phillips ... Diploma
Patent mill-dog—G. W. Rodebaugh ... Diploma
Pump and feed water heater—D. E. Rice, Detroit ... Silver Medal and $5 00
For the best new article relating to steam, we award the $5, believing that it deserves a special recognition, we award it in addition, a ... Silver Medal

For the best new article relating to navigation, we award the premium of $5 to H. C. Pearson, Ferrysburg, Mich., for compass-cards for correcting ships' courses. And in recognition of its merit as a means tending to prevent the loss of life and property at sea, so constantly occurring from compass deviations, we recommend it for the highest award of the Society, a silver medal.

(Signed), WM. M. FERRY,
Superintendent Machinery Department.
H. F. EBERTS,
FRANK E. KIRBY,
JOHN MEAD,
Judges and Committee of Awards.

DIVISION J.

CLASS 45.—HOME-MADE.

Pair woolen blankets—Mrs. W. F. Lewis, Pontiac, 1st premium	$3 00
Ten yards woolen flannel—Mrs. R. Stage, Pontiac, 1st premium	3 00
One hearth rug—Mrs. John Brennan, Detroit, 1st premium	2 00
Mrs. L. D. Cook, Flint, 2d premium	1 00
Ten yards rag carpet—Mrs. R. Stage, Pontiac, 1st premium	3 00
Mrs. Joseph Ellis, Detroit, 2d premium	2 00
One woolen coverlet—Mrs. R. Stage, Pontiac, 1st premium	2 00
One pair woolen stockings—Mrs. Richard Elliott, Lansing, 1st premium	1 00
Mrs. R. Stage, Pontiac, 2d premium	50
One pair woolen socks—Mrs. Richard Elliott, Lansing, 1st premium	1 00
Mrs. W. F. Lewis, Pontiac, 2d premium	50
One pair woolen mittens—Mrs. W. F. Lewis, Pontiac, 1st premium	1 00
Mrs. Richard Elliott, Lansing, 2d premium	50
One pair woolen gloves—Mrs. Richard Elliott, Lansing, 1st premium	1 00
Mrs. Richard Elliott, 2d premium	50
Two lbs. stocking yarn—Mrs. W. F. Lewis, Pontiac, 1st premium	2 00
Mrs. R. Stage, Pontiac, 2d premium	1 00
One pair cotton socks—Miss Mary E. Peacock, Pontiac, 2d premium	50
One pair cotton stockings—Miss Mary E. Peacock, Pontiac, 2d premium	50

Best and greatest variety of articles, not less than 10 in number, manufactured by any one family, etc., 2d quality, Mrs. Richard Elliott, Lansing, discretionary $2 00

T. C. PHILLPS,
MRS. ROE STEPHENS,
MRS. DAVID PRESTON,
MRS. M. C. HART,
Committee.

CLASS 46.—MATERIALS.

Best display of fine wool, not less than 10 samples, J. S. Wood, Saline, 1st premium $3 00
Best display of long wools, not less than 10 samples, A. F. Wood, Mason, 1st premium 3 00
Best display of middle wools, not less than 10 samples, Thomas A. Moore, Ypsilanti, 2d premium 2 00
The middle wool was good but badly put up, therefore give 2d premium.
Fourteen samples of wool, John Taylor, Marcellus, discretionary premium.

C. L. WHITNEY,
J. S. KIES,
J. G. SELDEN,
Committee.

CLASS 47.—FACTORY MADE.

Display of goods from any woolen factory in Michigan, Clinton Woolen Manufacturing Co., Clinton, 1st premium $15 00
North & Selden, Vassar, 2d premium 10 00
Piece of fancy cassimere, weighing 12 oz. or over per yard, Clinton Woolen Manufacturing Co., Clinton, 1st premium 3 00
North & Selden, Vassar, 2d premium 2 00
Piece of plain cassimere, weighing 12 oz. or over per yard, Clinton Woolen Manufacturing Co., Clinton, 1st premium 3 00
Best and largest display of flannels made by any one factory in Michigan, Clinton Woolen Manufacturing Co., Clinton, 1st premium 3 00
North & Selden, Vassar, 2d premium 2 00
Best piece of overcoat cloth, weight not less than 12 oz. or over per yard, Clinton Woolen Manufacturing Co., Clinton, 1st premium 3 00
Best piece of broad cloth manufactured in Michigan, Clinton Woolen Manufacturing Co., Clinton, 1st premium 5 00
Best display of cotton or silk goods manufactured in or out of the State, Freedman & Bros., Detroit, 1st premium 5 00
Best and handsomest display of carpets, Abbott & Ketchum, Detroit, 1st premium 3 00
Freedman Bros., Detroit, 2d premium 2 00
Best and handsomest 5 hearth rugs, Abbott & Ketchum, Detroit, 1st premium 2 00
Best and handsomest 5 fancy door mats, J. Nall, Jr. & Co., Detroit, 1st premium 2 00
Best display of window curtains, J. Nall, Jr., & Co., Detroit, 1st premium... 2 00
Best and finest display of window shades, Freedman & Bros., Detroit, 1st premium 2 00
Best display of oil cloths, Abbott & Ketchum, Detroit, 1st premium 2 00
Best white woolen blankets, Freedman & Bros., Detroit, 1st premium 2 00
Best 2 Marseilles quilts, Freedman & Bros., Detroit, 1st premium 2 00
Best display of paper hangings, Wm. Wright & Co., Detroit, 1st premium... 2 00
Superior display of long wool dusters, lap robes, sheep skins, loose and wool mats, Jerome H. Bishop, Wyandotte, discretionary 10 00
Largest and tasteful display of foreign dress and dry goods, millinery, carpets, oil cloths, rugs, door mats, curtains, shades, etc., Freedman & Bros., Detroit, discretionary .... Diploma
Large and good display of carpets, oil cloths, rugs, mats, curtains, lambrequins, etc., Abbott & Ketchum, Detroit, discretionary 5 00
Tasteful display of general domestic dry goods, A. Williams & Co., Detroit, discretionary 5 00
Large and good display of carpets, curtains, cornice mats, rugs, etc., James Nall, Jr., & Co., Detroit, discretionary 4 00

Large and nice display of carpets and house furnishing goods, Barclay & Black, Detroit, discretionary ... $3 00
Display of window curtains, Freedman & Bros., Detroit, discretionary ... 1 00

B. F. PARTRIDGE,
FRIEND PALMER,
HENRY GLOVER,
Committee.

CLASS 48.—ARTICLES OF DRESS.

Best made overcoat—C. R. Mabley, Detroit, 1st premium ... $3 00
Best made dress coat—C. R. Mabley, Detroit, 1st premium ... 3 00
Best made frock coat—C. R. Mabley, Detroit, 1st premium ... 3 00
Best made shirts, three in number—C. R. Mabley, Detroit ... 2 00
Best display of clothing mape by exhibitor—C. R. Mabley ... Diploma
Best display of silk hats—Walter Buhl & Co., Detruit, 1st premium ... 2 00
Best display of fur hats—Walter Buhl & Co., Detroit, 1st premium ... 2 00
Best display of soft hats—Walter Buhl & Co., Detroit, 1st premium ... 2 00
Best display of boys' caps—Walter Buhl & Co., Detroit, 1st premium ... 1 00
Best display of gents' furs—Walter Buhl & Co., Detroit, 1st premium ... 2 00
Largest and best display of clothing, shirts, collars, ties, scarfs, &c.—C. R. Mabley, Detroit, discretionary ... 10 00
Nice display of shirts, collars, ties, scarfs, &c.—Gourlay Bros., Detroit, discre-cretionary ... 3 00
Nice display of clothing and pure woolen goods—Jenning & Fox, Detroit, discretionary ... 3 00
Nice display of military goods—Walter Buhl & Co., Detroit, discretionary ... 1 00
Nice display of Knights Templar and other society goods—E. A. Armstrong, Detroit, discretionary ... 3 00
Nice display of ladies' furs—Walter Buhl & Co., Detroit, discretionary ... 3 00
Rich display of hats, caps and furs not properly classified—C. H. Dickerson, Detroit, discretionary ... 3 00

B. J. PARTRIDGE,
H. GLOVER,
FRIEND PALMER,
Committee.

CLASS 49.—ARTICLES OF LEATHER AND INDIA RUBBER.

Best display of trunks not less than 10 in number—Martin Maier, Detroit, 1st premium ... $5 00
Best traveling trunk—Martin Maier, Detroit, discretionary ... 2 00
Best hand trunk—D. S. Mathews & Co., Detroit, 1st premium ... 1 00
Best display of traveling bags—Martin Maier, Detroit, 1st premium ... 3 00
Best pair gents' summer boots—Richard H. Fyfe, Detroit, 1st premium ... 1 00
Best pair of gents' winter boots—Richard M. Fyfe, Detroit, 1st premium ... 1 00
Best pair of kip boots—J. B. Swink, Detroit, 1st premium ... 1 00
Best pair of ladies' summer walking boots—R. H. Fyfe, Detroit, 1st premium, 1 00
Best pair of ladies' winter walking boots—R. H. Fyfe, Detroit, 1st premium ... 1 00
Best pair of ladies' winter shoes—R. H. Fyfe, Detroit. 1st premium ... 1 00
Best pair of gents' slippers—R. H. Fyfe, Detroit, 1st premium ... 1 00
Best pair of ladies' slippers—R. H. Fyfe, Detroit, 1st premium ... 1 00
Best double carriage harness—Allison & Hilbert, Detroit, 1st premium ... 3 00
Best single or buggy harness—Allison & Hilbert, Detroit, 1st premium ... 3 00
C. B. Clark, Armada, 2d premium ... 2 00
Best double harness for farm—George Latschee, Detroit, 1st premium ... 3 00
Best calf skins—George Kirby, Detroit, 1st premium ... 1 00
Best other kinds of leather—George Kirby, Detroit, 1st premium ... 1 00
Best horse collar—A. Sheeler, Detroit, 1st premium ... 1 00
Best leather belting—James P. Donaldson & Co., Detroit, 1st premium ... 5 00
Best rubber belting—James P. Donaldson & Co., Detroit, 1st premium ... 5 00
Best display of boots and shoes of all kinds—A. R. Morgan, Detroit, 1st premium ... 5 00
Best display of fancy robes—Walter Buhl & Co., Detroit, 1st premium ... 3 00
Best assortment of India rubber goods, boots and shoes—A. C. McGraw & Co., 5 00
Display of leather non-enumerated, head, horns, &c.—George Kirby, Detroit, discretionary ... 5 00

Display of heavy boots and shoes—S. P. Wilcox & Co., Detroit, discretionary,	$3 00
Display of gents' winter shoes and ladies' winter boots, &c.—J. B. Swink & Co., Detroit, discretionary	2 00
Best display of fine boots and shoes manufactured by exhibitor in this State —R. H. Fyfe, Detroit, discretionary	5 00
Good display of gents' winter shoes—J. B. Stevens, Detroit, discretionary	3 00
Twelve pair best heavy boots and shoes hand-made in Michigan by exhibitor—H. P. Baldwin 2d & Co., Detroit	Diploma
Display of boot and shoe patterns—P. C. Porter, Detroit, discretionary	2 00
Display of horse collars—A. Sheeler, Detroit, discretionary	2 00
Assortment of whip lashes—Wm. Skillington, Detroit, discretionary	1 00
Good display of music and medical cases, lunch boxes, ladies' and gents' shawl straps and dress and shirt cases—D. S. Mathews & Co., Detroit, discretionary	5 00
Fancy double harness—George Latschee, Detroit, discretionary	1 00
Assortment of boot and shoe uppers—Wm. J. Fisk, Detroit, discretionary	2 00
Display of cordage—James P. Donaldson & Co., Detroit, discretionary	5 00

P. C. PORTER,
JOSEPH M. PLACE,
Committee.

CLASS 50.—ARTICLES OF FURNITURE.

Set of parlor furniture, not less than seven pieces in display, sofa—C. Webber, Detroit, 1st premium	2 00
Lounge or couch—Horace Turner, Detroit, 1st premium	3 00
Easy chair—Horace Turner—Detroit, 1st premium	3 00
L. E. Cross, Detroit, 2d premium	2 00
Center table—C. Webber, Detroit, 1st premium	3 00
Mantel mirror—C. Webber, Detroit, 1st premium	5 00
Wm. Wright & Co., Detroit, 2d premium	3 00
Set chamber furniture, three pieces—Kirchberg, Winterhalter & Keenan, Detroit, 1st premium	8 00
Dudley & Fowle, Detroit, 2d premium	5 00
Spring mattress or bed—Dudley & Fowle, Detroit, 1st premium	2 00
James O. Fortu, Detroit, 2d premium	1 00
Mattress for bed—Dudley & Fowle, Detroit, 1st premium	2 00
James O. Fortu, Detroit, 2d premium	1 00
Extension table—C. Webber, Detroit, 1st premium	3 00
Side board—C. Webber, Detroit, 1st premium	3 00
F. Schafft, Detroit, 2d premium	2 00
Secretary—Aloy Dowling, Detroit, 1st premium	3 00
Parlor writing desk—G. S. Tompkins, Detroit, 1st premium	3 00
Office desk—G. S. Tompkins, Detroit, 2d premium	2 00
Desk of any kind—Dudley & Fowle, Detroit, 1st premium	3 00
Hall tree or rack—C. Webber, Detroit, 1st premium	2 00
Best display of furniture of all kinds—Kirchberg, Winterhalter & Keenan, Detroit, 1st premium	10 00
Dudley & Fowle, Detroit, 2d premium	5 00
Child's carriage—Frank Decker, Detroit, 1st premium	2 00
Best display of willow or rattan chairs—A. Dondero, Detroit, 1st premium	2 00
Best display of veneer—Geo. F. Mehling, Detroit, 1st premium	5 00
Wm. Wright & Co., Detroit, 2d premium	2 00
Best assortment of school furniture—Michigan School Furniture Co., Northville, 1st premium	5 00
Kapple & Howe, Detroit, 2d premium	3 00
Best display of burial cases and caskets—Grand Rapids Burial Case Co., Grand Rapids, 1st premium	5 00
Best collection of decorated porcelain and art tile—Wm. Wright & Co., Detroit, 1st premium	2 00
Best collection of painted slate—Wm. Wright & Co., Detroit, 1st premium	2 00
Best collection of picture frames—C. Widman & Co., Detroit, 1st premium,	2 00
Two dining chairs—C. Webber, Detroit, discretionary	1 00
Illuminated cover and one ebony and gold chair—Horace Turner, Detroit, discretionary	2 00
Upholstered hall chair—Horace Turner, Detroit, discretionary	1 00

Patent bed lounge—Horace Turner, Detroit, discretionary	$3 00
Box for ladies' dress—Horace Turner, Detroit, discretionary	1 00
Display of wall paper and paper ceiling decorations—Fred. Bamford, Detroit, discretionary	3 00
Display of fancy cabinet ware and brackets—F. L. Furbush, Grand Rapids, discretionary	3 00
Display of lambrequins, poles, slats, etc.—F. L. Furbush, Grand Rapids, discretionary	1 00
Display of fancy tables, stands, etc.—F. L. Furbush, Grand Rapids, discretionary	2 00
Fruit stand—C. Webber, Detroit, discretionary	2 00
Slat window shade—Wm. Lynch, Detroit, discretionary	1 00
One carved picture frame—C. Webber, Detroit, discretionary	1 00
One carved clock case and house—C. Webber, Detroit, discretionary	2 00
Display of French walnut—G. F. Mehling, Detroit, discretionary	1 00
Best and largest display of willow and rattan furniture—A. Dondero, Detroit, discretionary	10 00
One inlaid clock case, hand-made—Alloy Dowling, Detroit, discretionary	1 00
One cabinet—C. Webber, Detroit, discretionary	1 00
One divan—Horace Turner, Detroit, discretionary	1 00
One monarch billiard table—J. W. Brunswick & Balke & Co., Chicago, Ill., discretionary	5 00
Ebony decorated hanging cabinet—W. Wright & Co., Detroit, discretionary,	1 00
Nice display of frescoed ceiling, cornice and frieze—W. Wright & Co., Detroit, discretionary	5 00
Collection of fine decorated furniture—Wm. Wright & Co., Detroit	Diploma
Picture frame mouldings—C. Widman & Co., Detroit, discretionary	3 00
Two patent rockers—Dudley & Fowle, Detroit, discretionary	1 00
One settee, two opera chairs, six wall seats folding three chairs combined—Kapple & Howe, Detroit, discretionary	4 00
Best billiard and pool tables and outfit—Schulenburgh Manufacturing Co., Detroit	Diploma
One superior show case—J. Phillips & Bro., Detroit, discretionary	1 00
Combined wall protector and towel holder—E. Pullam, Detroit, discretionary	2 00
Combined ladies' work, cutting table, bureau and writing desk—Edward Pullam, Detroit, discretionary	2 00
One curtain pole, cornice, etc.—Kirchberg, Winterhalter & Keenan, Detroit, discretionary	1 00
Wooton cabinet secretary and flat rotary office desk, very superior—G. S. Tompkins, Detroit	Diploma
Large assortment of undertakers' supplies—Grand Rapids Burial Case Co., Grand Rapids, discretionary	3 00
One cylinder desk—C. Webber, Detroit, discretionary	3 00
Combined woods Eastlake sideboard—Wm. Wright & Co., Detroit, discretionary	2 00
Combined wood dining room sideboard and mantel, combined—Wm. Wright & Co., Detroit	Diploma
Two pieces of bed room suite, very nice (not full)—C. Webber, Detroit, discretionary	3 00
One mantel mirror—Fred. Bamford, Detroit, discretionary	2 00

This class was very large and full, but very many of the goods were not correctly entered or mentioned, but in the opinion of your committee were worthy of favorable mention, and we have therefore made or awarded a large number of discretionary premiums, which we trust will be approved.

C. L. WHITNEY,
I. C. PHILLIPS,
MRS. DAVID PRESTON,
MRS. ROE STEPHENS,
MRS. M. C. HART,
Committee.

CLASS 51.—STOVES, IRON WORK, AND ORNAMENTAL CONCRETE WORK.

Cast iron vase and pedestal—E. T. Barnum, Detroit, 1st premium	$3 00
Iron chair—E. T. Barnum, Detroit, 1st premium	1 00

Fruit and flowers stand—E. T. Barnum, Detroit, 1st premium	$1 00
Parlor grate, Ed. W. Stoddard, Detroit, 1st premium	2 00
Mantel and grate—Ed. W. Stoddard, Detroit, discretionary	5 00
Assortment of malleable castings, Genesee Iron Works, Flint, discretionary	2 00
Two iron columns and lot of iron casting—Younglove & Co., Cleveland, Ohio, discretionary	5 00
Best ornamental fountain with tubular fence around it—E. T. Barnum, Detroit, discretionary	5 00
Best display of iron and wire work, 13 entries—E. T. Barnum, Detroit, discretionary	10 00
Best display of hardware, scroll saws, wood-working tools, etc., T. B. Rayl & Co., Detroit, discretionary	5 00
One wire fruit stand—Wm. Snow, Detroit, discretionary	1 00
Fire place heater and ventilator—Louis Lang, Detroit, discretionary	2 00

J. H. KIES,
F. L. FURBUSH,
Committee.

DIVISION K.

CLASS 52.

Display of optical instruments—L. Black & Co., Detroit	Diploma
Set of mathematical instruments—L. Black & Co., Detroit	Diploma
Set of dental instruments—A. Kuhlman, Detroit	Diploma
Display of optical instruments—A. Kuhlman, Detroit	Diploma
Set of mathematical instruments—Whonlick & Zabriskie, Detroit	Diploma
Set of surgical instruments—A. Kuhlman, Detroit	Diploma
Display of musical instruments—C. J. Whitney & Co., Detroit	Silver Medal
Display of musical instruments—Roe Stephens, Detroit	Diploma
Artificial limbs—Jas. A. Foster, Detroit	Diploma
Metallic adjustable arm, leg and hand splint—Dr. Bissell, Detroit	Diploma
Display of spectacles—Johnson & Conrath, Detroit	Diploma
Display of fine perfumery—John Davis, West Bay City	Diploma
W. H. Prittie & Co., Detroit, discretionary	$2 00
Display of manufactured, chemical and pharmaceutical goods—Parks, Davis & Co., Detroit	Diploma
Steel dies, stencil plates and engraving plates—Wm. Rheimes & Co., Detroit,	Diploma
Hogguer's Tonic Bitters and display of special preparations—Dr. F. F. Hogguer, Detroit	Diploma
Piano—J. W. Becker & Son, Detroit	Diploma
Pipe organ—Wood & Simmons, Detroit	Diploma
Display of guns, ammunition and fishing tackle—J. F. Birsch, Detroit	Diploma
Model of an eye and telescopic eye tester—Johnson & Conrath, Detroit	Diploma
Steel seal press and steel letter cutting—Morton Stencil Co., Detroit	Diploma
Machinery for manufacturing spectacles and eye glasses—L. Black & Co., Detroit	Diploma
Electric apparatus—Detroit Electric Works, Detroit	Silver Medal
Artificial teeth on celluloid—Dr. G. B. Watkins, Detroit	Diploma
Display of reed organs—Clough & Warren Organ Co., Detroit	Diploma

JAS. H. MASON,
JAS. J. CONKLING,
Committee.

CLASS 52½.

Display of clocks—M. S. Smith & Co., Detroit, 1st premium	$3 00
Exhibitioh silver and plated ware—M. S. Smith & Co. Detroit, 1st premium	5 00
Exhibition table cutlery—M. S. Smith & Co., Detroit, 1st premium	2 00
Display of American watches—M. S. Smith & Co., Detroit, 1st premium	3 00
Case of jewelry—M. S. Smith & Co., Detroit	Diploma
Jeweler's and hotel registers—A. Schuler, Detroit	Diploma
For the display of M. S. Smith & Co., Detroit, of diamonds, century vase, gold watch chains, gold head canes, masonic jewels ... Diploma and	50 00
Regular block—Albert Fisher, Detroit ... Diploma and	2 00
Ornamental block and case—F. Lapp, Detroit,	Diploma

JAS. H. MASON,
JAS. S. CONKLING,
Committee.

The above committee was appointed by me and have performed all of the duties to the best of their ability.

G. S. WORMER, *Supt.*

J. P. Thompson, Secretary Michigan State Agricultural Society:

DEAR SIR:—The enclosed report from the committee on awards in my department K, Class 52 and 52½, has been carefully examined by me, and I fully concur with the suggestions therein contained, and recommend that the awards and suggestions be carried out by the society without any further report from me.

Your humble servant.

G. S. WORMER, *Supt.*

DETROIT, September 23, 1878.

Gen. G. S. Wormer, Esq., Superintendent Musical Department Michigan State Agricultural Society:

DEAR SIR:—The committee composed of James H. Mason and James S. Conklin, appointed by you to make examinations and award premiums in department "K," Class 52 and 52½, at the late meeting of the State Agricultural Society, having performed the duties assigned to them to the best of their ability, make the following report of their labor, which has reference more particularly to that class of awards styled "*discretionary*." 1. To entry No. 290, made by Messrs. C. J. Whitney & Co., we would recommend a silver medal for their very fine and varied displayof musical instruments, and all that goes to make up a first-class assortment of musical goods. The exhibit was not only entertaining to the many visitors at the Fair, but was very attractive. 2. Entry No. 677, American Sewing Machine Co.; entry No. 681, Singer Manufacturing and Family Sewing Machine Co.; entry No. 686, White Sewing Machine Co.; entry No. 692, R. M. Wanzer & Co., Sewing Machine Co.; entry No. 693, Wheeler & Wilson Sewing Machine Co., are all marked "discretionary." We were led to this decision, first, from the fact that the society made no offer of a premium for machine or goods in this line, and second, we found it impossible, owing to the short time that your committee had to perform their labor, and to the crowded state of the hall to do justice to the exhibitors themselves, and not wishing to be partial without a full and fair investigation as to the merits of the several machines, we decided to be "*discreet*," and make no decision that would give to either any advantage over the other. The machines named are all *first-class*, and the society is under many obligations to the several exhibitors, for the fine display made by them, and we would recommend that a vote of thanks be given by the society for the efforts made by the several exhibitors to make the Fair a success.

3. To entry No. 698, "Electrical Apparatus," the word "discretionary" was marked, and we would recommend that they be awarded a diploma and a silver medal for their fine display, which was not only very instructive, but amusing to the many visitors to the Fair, and added greatly to the success of the exhibition.

4. Entry No. 218 and 219, made by Messrs. M. S. Smith & Co., of display of diamonds, watches, fine gold chains, etc., and the wonderful Century Vase of solid silver, and valued at $50,000, which attracted so much attention at the great Centennial Exhibition at Philadelphia in 1876, we have marked "discretionary," and would recommend that they be awarded a diploma and a special cash premium of $50. There has probably *never* in the history of the society been exhibited as fine and valuable a display of diamonds, jewelry, watches, chains, canes, clocks, bronzes, etc., as was made by this firm at our late exhibition. To say nothing of the great *risk* made in taking so many and valuable goods on to a fair ground for exhibition, the expense of doing so must have been very large. In our opinion there was nothing on exhibition that attracted more attention, or did more to make the Fair one long to be remembered, than the exhibition made by Messrs. M. S. Smith & Co.

To all of the other exhibitors that came under our observation, we have marked such awards as in our judgment each was entitled. Trusting that our efforts will have been satisfactory to you and the society, we are

Yours most respectfully,

JAMES H. MASON, *Chn.*
JAMES S. CONKLIN.

DIVISION L.

CLASS SPECIAL—ORIGINAL PAINTING BY MICHIGAN ARTISTS.

Portrait of C. C. Trowbridge by L. T. Ives, Detroit, prize medal offered by Roehm & Wright	
Portrait from life, Autumn Evening—John Autrobus, Detroit, silver medal and	$5 00

Loch Katrine, by Robert Hopkin, Detroit, silver medal and	$5 00
War Horse in Battle Field, by J. K. Trego, Detroit, silver medal and	5 00

Report of Committee—In this class the exhibit was very large and added much to the interest of the department, and while the competition was only for a single prize, offered by Messrs. Roehm and Wright, the committee in consideration of the merit of the exhibit have recommended awards by the Society, of three silver medals and fifteen dollars in money.

H. P. BALDWIN,
BELA HUBBARD,
JOSEPH SILL,
SAM. LEWIS,
D. J. DAVISON,
Committee.

We fully concur in the recommendations of the committee.

W. J. BAXTER,
A. J. BROW,
Superintendents in Charge.

CLASS 53.—PAINTING AND SCULPTURE.

Best display of bronze statuary—M. S. Smith & Co., Detroit, 1st premium	$3 00
Best specimen of marble statuary—Henry Oliver Bourke, Detroit, 2d premium	3 00
Landscape painting in oil of scenery in Michigan—Robert Hopkins, Detroit, 1st premium	5 00
Robert Hopkins, Detroit, 2d premium	3 00
Historical painting in oil, done by exhibitor—J. K. Trego, Detroit, 1st premium	5 00
L. B. Chevalier, Detroit, 2d premium	3 00
Composition landscape in oil by exhibitor—Robert Hopkin, 1st premium	5 00
Chas. H. Eaton, Holly, 2d premium	3 00
Landscape from nature in oil, done by exhibitor—Robert Hopkin, 1st premium	3 00
Robert Hopkin, 2d premium	2 00
Landscape, Winter—M. L. Smith, Detroit, discretionary....Silver Medal and	5 00
Wood scene—Florence Waterman, Detroit, discretionary	2 00
View near Elyria—Charles H. Eaton, Holly, discretionary	2 00
Marine scene in oil, done by exhibitor, Robert Hopkin, 1st premium	3 00
Charles H. Eaton, Holly, 2d premium	2 00
Animal piece from life, in oil, done by exhibitor, J. K. Trego, 1st premium	3 00
J. K. Trego, 2d premium	2 00
Bird piece, in oil, done by exhibitor, Mrs. J. B. Nichols, Detroit, 1st prem'm	3 00
Charles H. Eaton, 2d premium	2 00
Fruit piece in oil, done by exhibitor, Mrs. W. W. Antisdel, Detroit, 1st prem.	2 00
Charles H. Eaton, 2d premium	1 00
Ida Hill, Detroit, discretionary	2 00
Flower piece, in oil, done by exhibitor, Mrs. W. W. Antisdel, 1st premium	3 00
Mrs. W. W. Antisdel, 2d premium	2 00
Portrait from life, large size, in oil, done by exhibitor, L. T. Ives, Detroit, 1st premium	5 00
J. K. Trego, 2d premium	3 00
Mrs. Wm. Stocking, Detroit, discretionary	2 00
Fancy painting in oil, done by exhibitor, L. T. Ives, 1st premium	3 00
J. K. Trego, 2d premium	2 00
Landscape painting in water colors of Michigan scenery—J. N. Mueller, Detroit, 1st premium	3 00
Robert Hopkin, 2d premium	2 00
Landscape painting in water colors, done by exhibitor, Robert Hopkin, 1st premium	3 00
Mrs. C. J. Elbert, Detroit, 2d premium	2 00
Portrait painting in water colors, done by exhibitor, Robert Hopkin, 1st premium	3 00
Mrs. John H. Thompson, Detroit, 2d premium	2 00
Mrs. John H. Thompson, discretionary	1 00
Animal painting in water colors, done by exhibitor, Mrs. Sylvester Larned, Jr., Detroit, 1st premium	3 00

Fancy painting in water colors, done by exhibitor, Mrs. Sylvester Larned, Jr., Detroit, 1st premium	$3 00
Mrs. Robert Wagner, Detroit, 2d premium	2 00
Sylvester Larned, discretionary	1 00
Historical painting, shown by any person, Robert Hopkin, 1st premium	2 00
Marine painting in water colors, shown by any person, Robert Hopkin, 1st premium	2 00
Robert Hopkin, 2d premium	1 00
Collection of oil paintings, not less than five, by a person not a dealer—L. T. Ives, 1st premium	5 00
Robert Hopkin, 2d premium	3 00
J. H. Trego, 3d premium	2 00
Mrs. W. W. Antisdel, discretionary .... Bronze Medal and	3 00
Collection of water color paintings, not less than five, by a person not a dealer—Mrs. Lylvester Larned, Jr., 1st premium	3 00
Robert Hopkin, 2d premium	2 00
Collection of oil paintings, by any dealer or association, twenty-five or more owned in Michigan—Deans, Brow & Godfrey, Detroit, 1st premium	10 00
Collection of water color paintings by any dealer or association, twenty-five or more owned in Michigan—Deans, Brow & Godfrey, 1st premium	5 00
Pastel painting of landscape—A. W. Abraham, Detroit, 1st premium	2 00
Crayon drawing of face—Lyman G. Bigelow, Detroit, 1st premium	2 00
Mrs. Jacob Hull, Detroit, 2d premium	1 00
Crayon drawing of animal—F. A. Pfeiffer, Monroe, 1st premium	2 00
Collection of photographs by any person—C. C. Randall, Detroit, 1st prem'm	3 00
L. G. Bigelow, 2d premium	2 00
Portrait photograph, life size—L. G. Bigelow, 1st premium	2 00
Landscape photograph—A. W. Abraham, Detroit, 1st premium	2 00
L. G. Bigelow, 2d premium	1 00
Portrait photograph, colored—C. C. Randall, 1st premium	2 00
Three cabinet photographs—L. G. Bigelow, 1st premium	1 00
One half dozen minature photographs—L. G. Bigelow, 1st premium	2 00
Engraving, steel plate—Deans, Brow & Godfrey, 1st premium	3 00
Pencil drawing by a person under fourteen years—Birdy Antrobus, Detroit, 1st premium	2 00
Birdy Antrobus, 2d premium	1 00
Drawing of any building on the ground—A. W. Abraham, 1st premium	3 00
India ink drawing—J. N. Mueller, Detroit, 1st premium	3 00
E. E. Myers, Detroit, 2d premium	2 00
Specimen of architectural drawing—E. E. Myers, 1st premium	3 00
Lloyd & Pearce, Detroit, 2d premium	2 00
Specimen of machinery drawing—W. H. Byram, Detroit, 1st premium	3 00
Sample of gilding on glass—Detroit Sign and Show Card Company, Detroit, 1st premium	2 00
Sign painting—Detroit Sign and Show Card Company, 2d premium	2 00
Deans, Brow & Godfrey, 1st premium	3 00
Display of gilt frames—Deans, Brow & Godfrey, 1st premium	2 00
Display of picture frames—Deans, Brow & Godfrey, 1st premium	2 00
W. H. Allen & Bro., Detroit, 2d premium	1 00
Display of artists' materials—Deans, Brow & Godfrey, 1st premium	2 00
Collection of Chromos, not less than ten in number—Deans, Brow & Godfrey, 1st premium	3 00
Chromo landscape—Deans, Brow & Godfrey, 1st premium	2 00
Deans, Brow & Godfrey, 2d premium	1 00
Chromo portraits—Deans, Brow & Godfrey, 1st premium	2 00
Deans, Brow & Godfrey, 2d premium	1 00
Chromo of animals or birds—Deans, Brow & Godfrey, 1st premium	2 00
Deans, Brow & Godfrey, 2d premium	1 00
Chromo of fruits—Deans, Brow & Godfrey, 1st premium	2 00
Deans, Brow & Godfrey, 2d premium	1 00
Set of stereoscopic views—Deans, Brow & Godfrey, 1st premium	2 00
Decorated pottery—R. W. King & Son, Detroit, silver medal and discretionary premium	5 00
Mrs. Sylvester Larned, Jr., Detroit, 1st premium	2 00
Mrs. B. F. Smith, Detroit, 2d premium	1 00
Painting on porcelain—L. G. Bigelow, discretionary	5 00

Hattie N. Leonard, Detroit, discretionary	$3 00
Miss Sharley Kelley, Detroit, 1st premium	2 00
Mrs. Robert Wagner, Detroit, 2d premium	1 00
Mrs. Robert Wagner, 3d premium	1 00
Painting on slate—Miss Sharley Kelley, 1st premium	2 00

Discretionary Premiums.

Fancy painting on silk for lambrequin or table—Mrs. John H. Thompson, Detroit	$3 00
Display of glass signs—Detroit Sign and Show Card Company	3 00
Specimen of crayon drawing of Moses and the ten commandments (in old English)—S. Grant Haywood, Ypsilanti	3 00
Pencil portrait of Wm. C. Bryant, by S. Grant Haywood, Ypsilanti	5 00
Fruit piece in oil, by E. C. Hathaway, (entered by Deans, Brow & Godfrey)	2 00
Case of tintypes—Charles Levy, Detroit	2 00
Landscape from nature—Ph. G. Cramer, Detroit	2 00
Collection of crayon drawings, by Pat. Reilly (entered by E. T. Burk, Detroit),	3 00
Frame of pencilings—Mrs. Dunspaugh, Detroit	3 00
Frame of pencilings—Mrs. Dunspaugh, Detroit	2 00
Curiosity in a bottle, wood carving with pocket knife—A. Horing, Detroit	1 00
Two pair bottles—Selma Robinson, Detroit	2 00
Sachet—Selma Robinson, Detroit	2 00
Two Plaques—Selma Robinson, Detroit	2 00
Two pastel panels—Selma Robinson, Detroit	2 00
Monuments—J. H. Eakins, Detroit	3 00
Best drawing of animals on the ground—Willie T. Trego, Detroit	3 00

H. P. BALDWIN,
BELA HUBBARD,
JOSEPH SILL,
SAMUEL L. LEWIS,
D. J. DAVIDSON,
Committee.

DIVISION L.

CLASS 54.—ARTICLES OF LADIES' DRESS.

Display of millinery goods—Mrs. J. P. Holly, Pontiac, 1st premium	$5 00
Madam Contellier, Detroit, discretionary	1 00
Ladies' walking dress—Madam Rabaut, Detroit, discretionary	2 00
Suit of under-garments—Rebecca Ford, Detroit, 1st premium	3 00
Display of corsets—Miss C. Kohler, Detroit, 1st premium	2 00
Corset—C. H. Curtiss, Detroit, 1st premium	2 00
C. H. Curtiss, 2d premium	1 00
Misses' suit—Madam Rabaut, 1st premium	3 00
Child's suit—Madam Hude, 1st premium	3 00
Infant's suit—Madam Rabaut, 1st premium	2 00
Madam Hude, 2d premium	1 00
E. Butterick & Co., fashions, etc.—George W. Willard, Detroit, discretionary,	1 00
Ladies' panier combination skirt—C. H. Curtiss, Detroit, discretionary	1 00

To the President and officers of the Michigan State Agricultural Society:

GENTLEMEN—Your committee appointed to award premiums in Division L, Class 54 and 55, would most respectfully report the performance of their duties completed as in their best judgment was proper. We find that in this department there are many entries worthy of mention that are not classified for same, and we are obliged to pass them with simply this honorable mention. The professional exhibit conflicts with the amateur. If suitable classification should be made in the professional and amateur list, the competition in both classes would be more active and the exhibit would be much larger in each class, and the award of premiums more satisfactory to at least the amateur exhibitors, who being obliged to compete with professionals are almost entirely shut out of the premium awards.

MRS. W. D. ROBINSON,
MRS. F. E. TRAFTON,
MRS. G. O. ROBINSON,
Committee.

CLASS 55.—PLAIN NEEDLE AND MACHINE WORK.

Specimen of plain needle work—Mrs. H. B. Chapman, Reading, discretionary	$1 00
Fine shirt, all by hand, Mrs. M. A. Chappell, Detroit, 1st premium	2 00
Fine skirt, all by hand—Mrs. J. E. W. Lumbey, West End P. O., 1st premium,	2 00
Miss Mary E. Peacock, Pontiac, 2d premium	1 00
Pair plain handkerchiefs—Mrs. C. G. Hampton, Detroit, 1st premium	1 00
Silk patchwork quilt, by hand—Mrs. Richard F. Bruce, 1st premium	3 00
Miss Jennie Briscoe, Detroit, 2d premium	3 00
Mrs. Richard F. Bruce, discretionary	1 00
Calico patchwork quilt, by hand—Mrs. Richard F. Bruce, 1st premium	2 00
Mrs. George P. Cogswell, Monroe, 1st premium	2 00
Agnes Payment, Detroit, 1st premium	2 00
Mrs. S. Taylor, Detroit, 2d premium	1 00
Mrs. Henry Haggerty, West End P. O., 3d premium	75
Pair of plain sheets by hand—Mrs. R. M. Cook, 1st premium	2 00
Mrs. John Thorburn, Holt, 1st premium	2 00
Pair of plain pillow cases made by hand—Mrs. R. M. Cook, Charlotte, 2d premium	1 00
Set of pillow sham sets—Mrs. J. B. H. Bratshaw, Detroit, 1st premium	2 00
Mrs. W. C. Barber, Detroit, 2d premium	1 00
Sample of braiding by hand—Mrs. H. B. Chapman, Reading, 1st premium	2 00
Specimen of hem-stitching—Mrs. John Thorburn, Holt, 1st premium	2 00
Fine shirt by machine—Ellen Morrissey, Detroit, 1st premium	2 00
Fine skirt by machine—Ellen Morrissey, Detroit, 1st premium	2 00
Infant's dress or skirt by machine—Ellen Morrissey, 1st premium	2 00
Quilt made and quilted by machine—Mrs. R. M. Cook, 1st premium	2 00
Mrs. G. P. Brown, Detroit, 2d premium	1 00
Plain chemise by hand—Mrs. J. E. W. Lumley, discretionary	50
Floor mats—Mrs. Richard F. Bruce, discretionary	50
Calico and silk patchwork quilt—Mrs. C. A. Morrison, Detroit, discretionary,	1 00
Sheet sham—Mrs. W. C. Barber, Detroit, discretionary	50
Sample of hand braiding—Miss Ella J. Hopper, Detroit, discretionary	50
Lace handkerchief—Lillie Hancock, Detroit, discretionary	50
Suit of underclothes—Rebecca Ford, Detroit, 1st premium	3 00

The committee have recommended discretionary premiums to the amount of six dollars and fifty cents. We concur in the recommendations.

W. J. BAXTER,
A. J. BROW,
Superintendents in charge.

CLASS 56.—EMBROIDERY AND ORNAMENTAL NEEDLE WORK.

Best and largest collection of ornamental needle work or embroidery, done by one person—Mrs. Ira Mayhew, Detroit, 1st premium	$8 00
Mrs. C. Halliday, Detroit, 2d premium	5 00
Specimen of embroidered infant's skirt in cotton—Mrs. Ira Mayhew, 2d premium	1 00
Pair of embroidered pillow covers in linen—Mrs. Ira Mayhew, 1st premium,	2 00
Mrs. C. Sonda, Detroit, 2d premium	1 00
Specimen of embrodered night dress—Miss Mary E. Peacock, Detroit, 2d premium	1 00
Specimen of embroidered infant's blanket, Madam Hude, Detroit, 1st premium	2 00
Mrs. M. E. Beach, Detroit, 2d premium	1 00
Specimen of embroidered handkerchief—Lewis Sherwood, Ypsilanti, 1st premium	2 00
Mrs. C. Halliday, Detroit, 2d premium	1 00
Specimen of embrodered letters in cotton and linen—Madame Hude, 1st premium	1 00
Specimen of embroidered infant's dress or skirt in silk—Miss Jennie Briscoe, Detroit, 1st premium	2 00
Miss Jennie Briscoe, 2d premium	1 00
Specimen of embroidered ottoman or chair cover in silk—M. C. O'Reilly, Detroit, 1st premium	2 00
Mrs. B. F. Smith, Detroit, 2d premium	1 00

Embroidered chair cover (child's)—M. C. O'Reilly, discretionary	$1 00
Specimen of embroidered piano or table cover in silk—Mrs. A. J. Brow, Detroit, 1st premium	2 00
Mrs. J. P. Holley, Pontiac, 2d premium	1 00
Specimen embroidered slippers in silk—Madam Hude, Detroit, 2d premium.	1 00
Specimen embroidered lady's dress or mantle in silk—Mrs. A J. Brow, 1st premium	2 00
Specimen chenille embroidery—Mrs. J. P. Holley, 2d premium	2 00
Sample pictures worked on worsted—Geo. J. Burkheiser, Detroit, 1st premium	3 00
Lewis Sherwood, Ypsilanti, 2d premium	2 00
Sample cut or raised work in worsted—Miss E. J. Hopper, 1st premium	2 00
Mrs. H. Walton. Pontiac, 2d premium	1 00
Sample pair of toilet mats in worsted—Mrs. B. F. Smith, Detroit, 1st premium	1 00
Mrs. W. Lewis, Pontiac, 2d premium	50
Combined fire screen in worsted—Mrs. L. C. Hunner, Detroit, 1st premium	2 00
Sample chair or ottoman cover in worsted—Miss Ella J. Hopper, Detroit, 1st premium	2 00
Mrs. H. Walton, Pontiac, 2d premium	1 00
Sample pair of slippers—Madam Hude, 1st premium	2 00
Embroidered sofa or applique pillow in worsted—Madam Hude, 1st premium	2 00
Miss Ella J. Hopper, 2d premium	1 00
Sample towel rack—Madam Hude, 1st premium	2 00
Mrs. J. P. Holly, 2d premium	1 00
Specimen sample foot rest—Miss Ella J. Hopper, 1st premium	1 00
Madam Hude, 2d premium	50
Specimen Honiton lace work—Miss C. L. Sellick, Utica, 1st premium	2 00
Miss C. L. Sellick, 2d premium	1 00
Applique embroidery—Mrs. J. P. Holley, Pontiac, 1st premium	2 00
Mrs. C. Halliday, Detroit, 2d premium	1 00
Crewel embroidery—Madam Hude, 1st premium	2 00
Sample embroidered bracket—Mrs. O. M. Hyde, Detroit, 1st premium	2 00
Mrs. C. Halliday, 2d premium	1 00

Discretionary Premiums.

Infants' fancy nursery basket to Madam Hude	$1 00
Infants' lace hood—Madam Hude	1 00
Embroidered work, chair in silk—Mrs. J. H. Merrill, Detroit	1 00
Bead and silk embroidered picture, Palmer's night—Mrs. L. C. Hunter, Detroit	3 00
Sofa pillow embraidered in silk—Mrs. A. J. Brow, Detroit	1 00
Basket of worsted flowers—Mrs. J. H. Hill, Detroit	2 00
Specimen bobbin lace—Mrs. A. Jones, Dearborn	2 00
Small embroidered rug—Mrs. Edwin Liggett, Detroit	1 00
Burlaps embroidered mat—Mrs. Dr. Ferguson, Detroit	1 00
Point lace collar and cuffs—Miss C. L. Sellick, Utica	1 00
Frame of worsted work—Mrs. Dunspaugh, Detroit	3 00
Embroidered rocking chair—Mary Michenfelder, Detroit	1 00

Messrs: Your committee have labored under great difficulties in making examinations and awarding premiums in this class. The attendance was so large as to render it extremely difficult to get round and properly examine articles, and in some cases, the persistent and unwarrantable efforts of exhibitors to bias the judgment or sway the action of the committee, have seriously hindered us in the performance of the duty assigned us. The exhibit was very large, and in most cases very creditable, and while we had considerable difficulty in arriving at conclusions entirely satisfactory to ourselves, we have endeavored to do impartial justice. Respectfully submitted.

MRS. ROE STEPHENS,
MRS. D. PRESTON,
MRS. M. C. HART,
Committee.

The committee have awarded special premiums to the amount of twenty dollars,

and considering the large number of entries and the merit of the articles, we think the recommendation very modest and fully concur in the amounts.

W. J. BAXTER,
A. J. BROW,
Superintendents in Charge.

CLASS 57.—CROCHET, KNIT AND FANCY WORK.

Afghan robe—Mrs. C. A. Brush, Detroit, 1st premium	$3 00
Mrs. Ida Altman, Detroit, 2d premium	2 00
Child's afghan robe—Madame Hude, Detroit, 1st premium	2 00
Cotton tidy—Mrs. James Graham, Detroit, 1st premium	2 00
Mrs. D. Bremner, Detroit, 2d premium	1 00
Worsted tidy—Miss Hattie Caryl, Detroit, 1st premium	2 00
Pair crochet toilet mats—Miss A. J. Brow, 1st premium	2 00
Pair crochet lamp mats—Miss Hattie Caryl, Detroit, 2d premium	1 00
Crochet hood—Madame Hude, Detroit, 1st premium	2 00
Mrs. J. P. Holley, Pontiac, 2d premium	1 00
Hand-knit bedspread—Mrs. R. Anderson, Flint, 1st premium	2 00
Mrs. B. Stage, Pontiac, 2d premium	1 00
Crochet shawl—Madame Hude, 1st premium	2 00
Miss Florence Near, Detroit, 2d premium	1 00
Crochet or knit lady's sack—Mrs. J. P. Holley, Pontiac, 1st premium	2 00
Crochet or knit child's sack—Madame Hude, 1st premium	2 00
Mrs. J. P. Holley, 2d premium	1 00
Crochet or knit infant's boots—Madame Hude, 1st premium	1 00
Mrs. T. B. Swales, Detroit, 2d premium	50
Crochet or knit infant's shirt—Madame Hude, 1st premium	1 00
Crochet or knit child's shirt—C. H. Curtiss, Detroit, 2d premium	50
Crochet or knit leggins—Madame Hude, 1st premium	2 00
Crocket or knit fancy mittens—Minnie P. Pierce, Detroit, 1st premium	2 00
Mrs. Richard Elliott, Lansing, 2d premium	1 00
Crochet or knit child's cap—Madame Hude, 1st premium	2 00
Fancy pin cushion—Madame Hude, 1st premium	1 00

Discretionary Premiums.

Air castle made of worsted and card board—Mrs. Post, Detroit	50
Knitting basket—Mrs. Seth Smith, Detroit	50
Collection of linen lace—Miss Mary A. Picknett, Detroit	1 00
Needlework mat—Mrs. Tyler, Greenfield	50
Large Centennial tidy—Geo. J. Burkheiser, Detroit	1 00
Chess table cover—Mrs. Jas. Graham, Detroit	50
Pair linen tidies—Mrs. D. Bremner, Detroit	50
Knit chatelain bag—Alice Richmond, Detroit	50
Carriage afghan—Miss Clara Anscomb, Bay City	1 00
Cotton tidy—Miss Lizzie Cummings, Detroit	1 00
Cotton tidy—Mrs. D. Bremner	50

The display of articles in this class was very large and creditable. In many cases it was difficult to decide, but your committee have endeavored to do justice to exhibitors. We have in cases of especial merit recommended discretionary premiums, though if we had felt at liberty to extend the list of special recommendations, we should have been glad to thus mention several other articles.

MRS. ROE STEPHENS,
MRS. D. PRESTON,
MRS. M. C. HART,
Committee.

The committee in this class have recommended discretionary premiums to the amount of seven dollars and fifty cents and we concur in the recommendations.

W. J. BAXTER,
A. J. BROW,
Superintendents in Charge.

CLASS 58.—HAIR, SHELL AND WAX WORK.

Best and largest display of hair work—Mrs. R. W. Allen, Detroit, 1st premium	$3 00

Display of wax work—Mrs. E. Moore, Detroit, 1st premium	$3 00
Mrs. C. Cummings, Ovid, 2d premium	2 00
Specimens of feather fans—Madam Coutellier, Detroit, 1st premium	1 00
J. W. Morrison, Detroit, 2d premium	50
Specimen of feather dusters—J. W. Morrison, 1st premium	1 00
Display of wax flowers—Mrs. E. Moore, 1st premium	2 00
Mrs. C. Cummings, 2d premium	1 00
Display of fruit in wax—Mrs. E. A. Burley, Detroit, 1st premium	3 00
Mrs. E. E. Myers, Detroit, 2d premium	2 00
Artificial flowers in paper—Mrs. M. E. Scott, Detroit, 1st premium	2 00
Artificial flowers in muslin—Mrs. M. E. Scott, 2d premium	1 00
Artificial flowers in feathers—Mrs. W. A. Dean, Warren, 1st premium	2 00
Miss Mary E. Peacock, Pontiac, 2d premium	
Boquet of artificial flowers in feathers—Mrs. Fred Reutchleo, Ann Arbor, 1st premium	2 00
Mrs. Elizabeth Myers, Detroit, 2d premium	1 00
Ornamental shell work—Mrs. E. E. Myers, Detroit, 1st premium	2 00
Spatter pictures—Mrs. Robert Weltz, Mt. Clemens, 2d premium	1 00
Wreath of shells—Mrs. E. Passaye, Wayne, 1st premium	2 00
W. N. Cook, Grand Rapids, 2d premium	1 00
Wreath of seeds—Miss Amelia Hornspicer, Detroit, 1st premium	2 00
Mrs. J. H. Hill, Detroit, 2d premium	1 00
Bouquet of dried grasses and plants—Miss May E. Peacock, 1st premium	2 00
Specimen of fancy leather work—Mrs. M. E. Scott, 1st premium	2 00
Display of hair dresser's work—Mrs. R. W. Allen, 1st premium	3 00

Discretionary Premiums.

Natural flowers, preserved—Mrs. E. Moore	1 00
Autumn leaves in paper—Mrs. M. E. Scott	2 00
Homestead in cardboard—Miss Sarah Granger, Detroit	2 00
Worsted wreath—Mrs. Seth Smith, Detroit	1 00
Hair wreath—Mrs. Elizabeth Zerbe, Detroit	1 00
Case of wax ferns and shells	2 00
Crosses of natural flowers embalmed—Miss Hattie Chandler, Detroit, 1st premium	2 00
Display of sheet wax—Mrs. E. Moore, 1st premium	3 00
Mrs. M. E. Scott, 2d premium	1 00
Wax Cross—M. C. O'Reilly, Detroit	2 00
Wreath of artificial flowers—Mrs. Elizabeth Myers, Detroit	2 00
Wax Panel—Mrs. E. Moore	2 00

Hon. President and officers of the Michigan State Agricultural Society:

GENTLEMEN—Your committee, who were assigned the arduous duty of examining and awarding premiums in Division L., Class 58, would most respectfully submit the following report and recommendations. They have in their best judgment awarded the premiums as the classified entries on the premium list would permit. They find many entries that were especially worthy of mention, and should have been awarded premiums, but not being classified we were obliged to pass them with this reference. We would suggest that the premium list should be changed in order that manufacturer's in hair and wax work should be allowed to compete in a class separate from the amateur exhibition. By adopting such a plan the competition would be more active, and the amateur artist would not be brought in direct competition with the manufacturers.

MRS. W. H. JENNINGS,
MRS. FRANK FOLSOM,
MRS. G. M. WHEELER,
Committee.

In this class twenty dollars are recommended as discretionary premiums, and as the articles thus mentioned are very meritorious, we recommend that the awards be ratified.

W. J. BAXTER,
A. J. BROW,
Superintendents in Charge.

CLASS 59.—PRINTING AND STATIONERY.

Specimens of leather binding of blank books—Richmonds, Backus & Co., Detroit, diploma and 1st premium.
Specimens of book printing—Richmonds, Backus & Co., diploma and 1st premium.
Set of blank books—E. B. Smith & Co., silver medal and first premium.
Richmonds, Backus & Co., complimentary discretionary, diploma and 1st premium.
Set of outline maps—E. B. Smith & Co., bronze medal and 1st premium.
Display of fine stationery—Richmonds, Backus & Co., complimentary diploma.
Display of fine stationery—E. B. Smith & Co., complimentary diploma.
Paper made from rags—Richmonds, Backus & Co., diploma and 1st premium.
Paper made for newspaper work—E. B. Smith & Co., silver medal and 1st premium.
Type writer—Richmonds, Backus & Co., bronze medal and first premium.
Ticket case—Charles N. Ayres, diploma and 1st premium.
Zell's Encyclopedia—C. L. King, Detroit, bronze medal and 1st premium.
Cook's "Representative Men of Michigan,"—F. A. Barnard, Cincinnati, O., diploma.
Half and full calf, fine bindings for printed books—E. B. Smith & Co., diploma and 1st premium.
Fine linen ledger papers and general display of books and stationery—E. B. Smith & Co., diploma and discretionary money premium.

GENTLEMEN—Your committee desire to make a special report on the displays made in blank books, fine bindings, fine stationery, etc. The exhibit of Messrs. Richmonds, Backus & Co., of fine leather bound blank books with raised and sunken panels, elegantly burnished with hand tool work, and intricately ruled, was the finest ever made in this State, while their show of writing papers, fine stationery, etc., was every way creditable. Messrs. E. B. Smith & Co., by a clerical error in making their entries of articles on exhibition, was thrown out of competition on some specialties. Their show of sets of blank books made to order for customers was meritorious, and their display of fine full and half calf bound books, with marble and gilt edges, were a special feature of their exhibit, while their show of fine stationary, print, book and linen ledger papers was full and complete. The small amount allowed for premiums on this class of goods is probably the reason for so small a competition in these most important industries, and the enterprise of the two well-known firms who made such elegant displays of their workmanship and wares must be rewarded by the small premium list which we were enabled to award them under the rules and the knowledge that in their specialties they cannot be excelled.

FRIEND PALMER,
WM. A. THROOP,
S. DOW ELWOOD,
Committee.

There are no premiums named in premium list. The committee have been very faithful and only recommended premiums for real merit. They recommend seven diplomas, three bronze medals, and two silver medals. The exhibit was very fine, and the committee have been very modest in their recommendations, and we unhesitatingly recommend that the premiums as recommended be awarded.

W. J. BAXTER,
A. J. BROW,
Superintendents in Charge.

DIVISION M.

CLASS 60.

To the President and Executive Committee of the Michigan State Agricultural Society:

The undersigned, Superintendent of Division M, Class 60, Miscellaneous Articles, would respectfully report: That on account of the limited space allotted to this department, it was very much crowded, and exhibitors were consequently prohibited from making as extensive displays of their articles and products as many of them desired. Notwithstanding the lack of adequate room, the character of the articles on exhibition, and the taste shown by the exhibitors in their arrangement of the same, this part of the Hall presented a very attractive appearance. There were also several very fine displays made outside the Hall of articles assigned to this department, and a large number of articles entered in this department were, for lack of room in this, and for other reasons, placed in other departments.

The Viewing Committee labored long and diligently, carefully examining every display, and every article entered in the department, except a very few, that they

were unable to find anywhere upon the grounds, and in their report to me, they make the following award and recommendations of premiums:

Best specimen glass manufactured in the State	Bronze Medal
M. machine shinges	$3 00
Collection of fire brick manufactured in the State	$3 00
Stone lime	2 00
Specimen of ground bone	5 00
Dairy salt (American)	3 00
One bbl. fine salt	3 00
One bbl. fine kettle salt	3 00
Wrought iron furnace	5 00
Wood turning	2 00

Non-enumerated Articles.

Display window glass, glass shades, glass-making tools and materials	5 00
Display oil tanks	Diploma
Display oil cans	Diploma
Sheet metal goods	2 00
Monument, headstone, and iron fence for cemetery ... Diploma	5 00
Sample of bungs	1 00
Long's patent tire iron	2 00
Two crates ax helves	1 00
One crate hammer handles	1 00
Pavilion	Silver medal
One slab American marble	2 00
Eagle Portland cement	2 00
Roman cement	2 00
One wheat map ... Diploma and	5 00
Display of fine cut, plug and leaf tobaccos—J. J. Bagley, Detroit	Silver medal
Display of fine cut, smoking and plug tobaccos	Diploma
Display of slate roofing material ... Rec. premium	2 00
Two five gallon cans of premium oil (for light)	Favorable notice
Tobaccos—Gusten, Merrill & Co., Bay City, Mich.	Diploma
Display of tobacco and cigars—Johnson & Wheeler, Detroit	Diploma
Display of chemical paints—S. H. Hart & Co., Detroit	Diploma
Display of earthen ware—Theodore S. Baldsley, Detroit	Diploma
Samples of slate and tin roofing—Sears Bros., agents, Detroit	Diploma
Samples of analyzed soils—Prof. R. C. Kedzie, Lansing, Mich., Com. Notice	and Silver medal
Fire and burglar-proof safes and vault doors—Detroit Safe Co.	Silver medal
Samples of granite—Avery, Patterson & Co., Detroit	5 00
Monuments and cemetery work—Avery, Patterson & Co., Detroit	Diploma
Manufactured articles of copper, brass and heavy sheet iron—James Walker & Son	Diploma
Homestead superphosphates	5 00
Combination gas machine (a fine display)	Diploma
Display of cigars (a fine display)	Diploma
Sample of Michigan insects	3 00
Case of foreign beetles	2 00
Samples of analyzed Indian corn—Prof. R. C. Kedzie, Lansing, Mich.	Com. Notice and Silver medal
Display of fine cut tobacco—Granger H. & G. M., Detroit	Diploma
Four-oared working boat	5 00
Display of plug tobacco—Holmes & Wagner, Detroit, Mich.	Diploma
Assortment of brushes manufactured in the state	Diploma
Display of stucco-center pieces and ornaments ... Diploma and	3 00
Sample barrel made of two staves	2 00
Bundle staves, half barrel each	2 00
Ornamental pyramid	2 00
Display lead pipe, sheet, bar and pig lead and plumbers' materials—J. W. Raymond & Co., Detroit	3 00
Display of tobacco—Foxen, Newman & Co., Detroit	Diploma
Plain and ornamental fences, manufactured by exhibitor, 2d premium	3 00
Boat model in glass case	2 00
Fancy hand and machine-made flower pots—Theodore Becker, Detroit	3 00
Iron fence	Diploma

Ornamental vases	$2 00
Display of oils	5 00
Total cash premiums recommended	$77 00
Total number of diplomas recommended	19
Total number of silver medals recommended	5

All of which is approved and respectfully submitted.

J. WEBSTER CHILDS,
FRANKLIN WELLS,
WM. B. M'CREERY,
C. K. CARPENTER,
GEO. A. SMITH,
Committee.

DIVISION X.

CLASS 61.—CHILDREN'S DEPARTMENT.

Specimen of printing by a boy twelve years old—A. P. Strong, Detroit	2 00
Pencil drawing by a girl twelve years old—Lizzie Kramer, Detroit	3 00
Pencil drawing by a girl thirteen years old—Josie Kramer, Detroit	2 00
Pencil drawing by a girl nine years old—Lillie Kramer, Detroit	1 00
Pencil drawing of locomotive—Charles K. Shutterlee, Utica	1 00
Calico patchwork quilt, children from four to nine years old at "Home for the Friendless," 1st premium	2 00
R. C. Thorborn, Holt, 2d premium	1 00
Piece of wax work—Eva Swain, Detroit, 1st premium	2 00
Eva Swain, 2d premium	1 00
Bouquet of wax lilies—Gertie E. C. Sutton, Orion, 3d premium	50
Pair of knit stockings—Thomas Langley, Greenfield, 1st premium	1 00
Best exhibition of scroll sawing—Jane J. Ackerman, Detroit, 2d premium	2 00
Handkerchief box made from scroll work—F. Harvey, Utica	1 00
Collection of fancy needlework—Minnie Montgomery, Detroit, discretionary	3 00
Piece of bead work—Gertie E. C. Sutton	1 00
Shelf lambrequin of Macrami lace—Florence Dickinson, Detroit	2 00
Needlework picture by a girl seven years old—Dory Michenfelder, Detroit	1 00
Suit of doll's furniture—Jane J. Ackerman	2 00
Piece of point lace—Gertie E. Sutton, 1st premium	1 00
Chair tidy of worsted and cloth—Gertie E. C. Sutton	50
Piece of bead work—Gertie E. C. Sutton	50
German raised work in worsted—Gertie E. C. Sutton, 1st premium	2 00
Patchwork sofa pillow—Gertie E. C. Sutton, 2d premium	1 00
Air Castle—Emma Eloif, Detroit, 1st premium	2 00
Oil Painting—Dollie P. Christie, Detroit, 1st premium	3 00
Crayon drawing—Dollie P. Christie, 2d premium	1 00
Lady's shawl—Mary Beckbissinger, East Saginaw, 2d premium	1 00
Infant's skirt—Mary Beckbissinger, East Saginaw, 2d premium	1 00
Child's blanket—Mary Beckbissinger, 2d premium	1 00
Round tidy—Mary Beckbissinger, 2d premium	1 00
Knit mittens—Mary Beckbissinger, 2d premium	1 00
Child's Afghan—Mary Beckbissinger, 1st premium	2 C0
Girl's cloak—Mary Beckbissinger, 1st premium	2 C0
Child's leggings—Mary Beckbissinger, 2d premium	1 00
Largest collection of articles in needlework—Mary Beckbissinger	5 00
Pencil drawing—Royal Farrand, Detroit, discretionary	1 00
Minature brig, with complete outfit—Chas. Francis Bourke, Detroit	2 00
Collection of drawings—Myrtle Walker, Sherman City	1 00
Worsted picture on cardboard—Henry McClumpha, Plymouth	1 00
Fancy work by a boy seven years old—Wm. Deering, Detroit	2 00
Pair woolen stockings—Inie Gibson, Detroit, 1st premium	1 00
Set of spatter work tidies—Inie Gibson, Detroit, 1st premium	2 00
Crayon work—Frank Lyon, Detroit, 2st premium	2 00

The committee have examined the articles in this department and awarded the premiums to the best of their ability, and hope that it will be entirely satisfactory.

MRS. J. J. GARRISON,
MISS CONGER,
MRS. M. H. DEAN,
Committee.

In this class all the premiums were discretionary. They had, of course, to be given with reference to value of articles exhibited, amount of work, skill, etc., required. The entire amount awarded is sixty-six dollars and fifty cents. We recommend that the awards be confirmed.

W. J. BAXTER,
A. J. BROW,
Superintendents in charge.

REPORTS FROM COUNTY AGRICULTURAL SOCIETIES.

SIXTH ANNUAL CONVENTION OF ASSOCIATION OF AGRICULTURAL SOCIETIES OF MICHIGAN, AT LANSING, JANUARY 15, 1879.

The sixth annual Convention of the Association of Agricultural Societies of Michigan, was held at the city of Lansing on Wednesday, Thursday and Friday, January 15, 16 and 17, 1879.

Convention opened at the city council rooms, Wednesday evening, at 8 P. M. The following is a list of the

DELEGATES IN ATTENDANCE.

Calhoun—G. W. Briggs, S. T. DeForrest, G. S. Woolsey.
Eaton—F. L. Reed, Seth Ketchum.
Genesee—S. R. Billings, D. Horton.
Hillsdale—Alex. Hewitt.
Ingham—A. F. Wood, G. W. Bristol.
Jackson—A. M. Tinker.
Kent—M. B. Hines.
Ealamazoo—W. H. Cobb, Frank Little.
Lenawee—S. B. Mann.
Lapeer—Ira H. Butterfield.
Mason—Chauncey Gibbs.
Muskegon—C. L. Whitney.
St. Joseph—D. D. Antes.
Van Buren—David Woodman, A. C. Glidden.
Washtenaw—Chas. H. Richmond, James B. Vanatta, Sampson Parker, A. T. Case, J. J. Robinson.
Agricultural College—R. G. Baird, Secretary.
Central Michigan Society—O. M. Barnes, Ben B. Baker, L. B. Potter, George Thomas, J. N. Smith, F. Danforth.
Central Society at Hubbardston—A. T. Sessions.
North Berrien and M. L. S. Society—James F. Highbee.
Plainwell Society—G. Batchelor.
State Pomological society—C. W. Garfield.
State Agricultural Society—J. Webster Childs, Wm. H. Cobb, D. W. Howard.

Mr. A. C. Glidden, of Paw Paw, President of the Association, delivered the following opening address:

GENTLEMEN OF THE AGRICULTURAL SOCIETIES OF MICHIGAN:—It seems appropriate that once in each year the several Agricultural Societies of the State should send their representatives to a general convention, to compare results and to unite in recommending what appears, from the experience of the members, to be the most practical method of conducting county fairs.

The acknowledged intelligence of our agriculture, the variety of the products and their uniformity throughout the State, render a uniform system of conducting fairs possible and very desirable. No individual or corporation has the moral right to any exclusive wisdom. The best good of each is the proper method for all to adopt.

The ideal society is one which shall have for its object and aim a higher standard of excellence in each department of agriculture, so that its fairs shall be an exponent of that higher standard, and its prizes should be given as stimulants to a healthy emulation among its members. The society that aims only at a financial success by whatever means or appliances,—becoming merely a hippodrome for the delectation of uncultivated tastes,—has but illy acquitted itself of the responsibility assigned it. A broader burlesque upon the true dignity of agriculture could not be presented. I am glad to know that such exhibitions are now rare, and are growing gradually less.

Could the statistics of each agricultural society in the State be collected and collated, showing the separate and aggregate amount of prizes offered in each department, with the separate and aggregate amounts paid, the amount received from all sources, the running expenses aside from prizes, the value of fixtures, appurtenances and grounds, and the indebtedness thereon, a very valuable showing might be made as the basis for your discussions. An attempt has been made by your secretary in this direction, but the responses to his inquiries have been very few, and the results of the investigations are very unsatisfactory. We need a Department of Agriculture, recognized by law, with headquarters in the State House, over which the Secretary of the State Board of Agriculture, or some other official shall preside, and from which shall issue blanks to the secretaries of the several agricultural societies, making the appropriation of money by the board of supervisors, contingent not only upon compliance with the present provisions of the law, but also upon the proper reports having been made. Then this convention could determine which of the several departments of agriculture were being fostered and which were failing for want of a proper recognition by agricultural societies, and recommend such changes as would seem proper from the showing.

Subserving the interest of agricultural societies is but a small part of the good to agriculture that would result from the establishment of such a department. For the better promotion of this interest, and some of which such a department could furnish, are a museum of the agricultural products of our State; a fully equipped agricultural library; headquarters for scientific investigation,—analyses of soils, of grains, or the results of former analyses furnished; a compilation of an annual agricultural census report. In short, a compendium of agricultural knowledge gathered in the interest of an occupation which controls fifty per cent of the wealth of our State, and employs five-sevenths of all the voters engaged in industrial and commercial pursuits.

Nature seems to have fitted this lower peninsula of ours to be exclusively an agricultural region; and the diversity of its indigenous products will ever give to agricultural shows a variety which will tend to perpetuate them, in some form, for many coming generations. In the very nature of things agriculture can never come to a stand-still. A prosperous agriculture means prosperity everywhere. But no industry can become prominent by being ignored,—it needs the fostering care of legislation; wise counsels must prevail, and all the aids which wisdom can formulate should be used to stimulate its progress.

Gentlemen, you each have probably spent valuable time and more or less money to stimulate that branch of agriculture which you here represent. Every person and occupation within the circle of your influence has been benefited by your unselfish labor. Your devotion to the real interest of your society has doubtless drawn down upon you unjust criticism. Your failures have been very audibly condemned and your successes very faintly commended. Shall individual effort without compensation be the sole support of this great interest? I submit whether a change in the law should not be so made as to require the Board of Supervisors upon the proper showing of the officers, to assess upon the property of the county at least the minimum amount contemplated in the law. I apprehend that one reason for the lack of attendance of very many representatives of this convention is a lack of funds to defray the expense attending it. The world has yet to listen to the argument against the utility of agricultural fairs. They are as necessary and as natural to an intelligent agriculture as diagrams and models are to mechanics; and the only recognized public appreciation of their value is the option which the Board of Supervisors have of assessing one dollar on each $40,000 of the property interested. This is the only opportunity the public have of equalizing the labor of conducting a county fair, and yet the Board of Supervisors can throw the entire burden upon less than twenty men. The burden of the taxation is illustrated by the fact that a person must be worth four hundred dollars before he can contribute his penny toward sustaining such an important enterprise; and a property of $10,000 is necessary to raise a sum equal to the value of an entry ticket at any of our county fairs. The matter of taxation is insignificant to the value the fund would be to every organized society in the State.

But, gentlemen, I again urge upon you the importance of stimulating by your suggestions only that which is purely agricultural or mechanical. There are influences which come before you each year, clamoring for recognition that will, in the end, as surely destroy your prosperity as a cancer virus in the blood will destroy its victim. The best representation of agriculture the world has yet seen cannot afford to so formulate its government that vice may enter and become protected; that low forms of excitement may become popularized to corrupt its young men; but so regulate your fairs that they may become exponents of the highest type of agriculture,—a lesson to learners and the pride of your public.

SECRETARY'S REPORT.

Frank Little, of Kalamazoo, Secretary of the Association, then made the following report:

Mr. President and Gentlemen of the Convention:

It has been my purpose, at the opening of the State Association of Agricultural Societies of Michigan, to present to the Convention, as an important and prominent feature of my report, a tabular statement, embracing certain statistics in regard to the several Agricultural Societies of the State, arranged in the following order:

1st. List of all the societies of the State.
2d. Location of the various fairs.
3d. Whole number of members.
4th. Total receipts of each society for the past year.
5th. Total amount offered in prizes by each.
6th. Total amount awarded in prizes by each.
7th. Total of contingent expenses other than prizes.
8th. Total value of property owned by each society.

In the call issued to the various societies under date of December 7, 1878, notifying them of this convention, and of the importance of sending one or more delegates to participate in its deliberations, there was appended a statistical circular, soliciting answers to the various questions as heretofore enumerated.

I regret to say, that a large number of the societies of the State, have not as yet responded to the request to forward promptly such statistics, and that in consequence of this neglect, my report in the direction indicated will be very incomplete.

From a carefully prepared list submitted at the last convention at Marshall, and from the best information upon the subject to be derived, we find that there are fifty-three associations, agricultural, horticultural and mechanical in the State, holding annual fairs; twenty-two societies that give no public exhibitions, but that hold stated meetings for the discussion of agricultural topics, making a grand total of seventy-five organizations, designed expressly for the encouragement and promotion of agriculture.

Who can estimate the weight of influence they exert, and the benefits that have accrued to the farming interests of Michigan, through the direct agency and work of these societies?

Are they not emphatically, in the fullest sense possible, organizations of the people and for the people?

Do they not reach into, and infuse with new energy and awakened desires, the very soul and substance of agricultural life?

Their influence is felt in the field, the garden, the orchard and the household. Ambitions are aroused; all branches of farm industry are stimulated upward and onward in the grand march of human progress, towards a nobler and higher type of civilization and intelligence.

These societies also encourage fine arts, manufactures, inventions, commerce and scientific research. In every way possible their aim is, to develop thought, to promote investigation, aid experimental tests, and enlarge the capacities of the people.

The annual fairs bring together in friendly relationship and closer fellowship, the rural population of the community, State and nation. Where all have an identity of purpose, they seek to unite as in one great brotherhood the whole family of man.

Old friendships are here renewed, new acquaintances are formed, and the whole social fabric of rural life becomes thoroughly renovated and awakened.

As mediums or occasions for the free interchange of views and experiences; for the rapid dissemination of advanced ideas and new processes in farming; for bringing to light the achievements of the year, they are invaluable.

While these organizations, as grand conservators and promoters of public interests are laboring assiduously and disinterestedly, year by year; while the good they

accomplish is given to the world gratuitously, without money and without price; yet, to our astonishment, a large percentage of the people they are designed to benefit, seem totally indifferent as to their success or failure.

Upon a careful examination of the census returns of the State, wherein may be found a classified list of the occupations of the entire population of male adults, then, taking the total memberships and the aggregate receipts of all the societies of the State into account, we are strongly inclined to conclude, that of the farming class, embracing young and old of both sexes, full seventy per cent do not contribute in any way, directly or indirectly, to the support of agricultural societies. Exception is here made, of course, to those few counties in the State, whose boards of supervisors levy a small tax in aid of their respective societies. A tax reprisal is not a *contribution*, in the sense of the term as here used.

It should be said in mitigation, that our Michigan farmers are no worse in this respect, than those of other States. Probably no where in the United States are agricultural exhibitions patronized by the entire population, as in the leading countries of Europe. There, nearly every incorporated town has its annual grand cattle show and fair; lasting in many instances, two or three weeks.

In our own State it is undoubtedly true, that nearly all the county agricultural societies languish, and hold a precarious existence, for the want of financial support. Officers and business managers of fairs realize the gravity of the situation, in view of a capricious public; responsibilities incurred, means to be secured to pay premiums and expenses; so that the final outcome at the treasurer's office is always a matter of anxious solicitude.

Realizing that so many, for reasons best known to themselves, are indisposed to support these societies as a matter of principle, I had said, religious duty,—all sorts of questionable expedients have been resorted to: tricks to induce people to enter the grounds, premium lists are arranged, offering most ridiculous and nonsensical prizes. Large sums of money are appropriated, frequently from a bankrupt treasury, to place on exhibition monstrosities, human or otherwise; while greased pigs, fat women, profligate preachers, defunct politicians, race horses, pool sellers, mammoth squashes, weddings, baby shows, etc., divide the attention of an appreciative audience.

Is it wise? is it manly for us to engage in this work merely as a financial speculation, and upon the basis above indicated? Have not the people already wearied of these *attractions*, so-called? Do they not know that all such schemes are at best a fraud and a cheat, yielding no beneficial results whatever?

But I have already trespassed upon the time of the convention. I would most cheerfully endorse the recommendations and suggestions of our worthy president, and anticipate much practical good to result from this meeting.

There are a few topics, that I trust may be incorporated in the report of the committee to be chosen, on the order of business of the convention; of which I will give a mere outline:

First, As to an equitable division of prizes.
Second, Privileges if any to be given exhibitors over the general public.
Third, Officers of fairs competing for and receiving prizes.
Fourth, Number of days that fairs should be held.
Fifth, The general rule of competition defined.

Before closing my report I wish to note the gratifying fact, that there is a growing interest taken throughout the State in the "institutes" that are being held and conducted by the officers and faculty of the Agricultural College; and also in the meetings and discussions of the State Pomological Society. The lectures, essays and practical suggestions there given, are of world-wide interest, and as a part of our agricultural literature, are invaluable. I trust the day is not far distant, when we shall have active, efficient organizations in all the older counties of the State; holding stated meetings, for the free interchange of experiences and practical discussions upon the whole science and business of farming.

I may add in this connection, that the published annual reports of the agricultural department of the State, compiled and prepared by the Secretary of the State Board of Agriculture and the Secretary of the State Pomological Society, are both valuable documents, eagerly sought after and read by the people of the State.

The tabular statement referred to at the beginning of this report, with the statistical returns from such societies as responded to the circular sent out by the secretary, is herewith respectfully submitted.

[See report at close, immediately following proceedings of the convention.]

FRANK LITTLE, *Sec'y, &c.*

On motion of R. G. Baird, a vote of thanks was tendered to the Secretary for his able report, and for his strenuous efforts to collect statistics from agricultural societies.

Committees Appointed.

The following committees were appointed:

Order of Business—Frank Little, C. L. Whitney, R. G. Baird, G. S. Woolsey, C. H. Richmond.

Preparation of blanks for statistics—Frank Little, A. M. Tinker, S. B. Mann, D. D. Antes, L. B. Potter.

Legislation—D. Woodman, M. B. Hines, J. J. Robinson.

Perfecting organization of association—C. L. Whitney, G. W. Briggs, James F. Higbee.

Morning Session, Thursday, January 16.

Convention opened at 10 A. M. in the new capitol—Pioneer Society rooms. R. G. Baird, secretary of the State Board of Agriculture, as previously arranged, addressed the meeting.

SECRETARY BAIRD'S ADDRESS.

President and members of the Association:

In the circular issued for this meeting I find the following announcement: "Approved methods in conducting fairs; premiums; wholesome rules and regulations; and how best to aid in developing and stimulating the farming interests of Michigan, will be the main topics for discussion." As I had no definite knowledge of what it was expected I should set forth in this address, I concluded that any suggestions in the line of what is indicated in the above would be pertinent to the occasion. So I have chosen as the subject of my remarks: Agricultural societies—what they are doing, and what can we reasonably expect them to do for the agriculture of our state.

Nearly all the great achievements of mankind testify to the importance of organization. There are many things that cannot be accomplished by unaided individual enterprise, but everything within the limits of what is possible to human power may be accomplished by organization and combination. This is as true and as practicable in regard to agriculture as anything else. The purpose of organization among farmers, no matter what form the organization may take, whether it be that of a grange, a farmer's club or an agricultural society, is to elicit information—to excite interest, and to develop important facts. The holding of fairs is one of the means of doing this. A danger, however, lies in the tendency to regard the fair as in itself an end rather than as a means, and the effort put forth almost wholly to make it a financial success, is too narrow in its aim. As the success of a school cannot be measured by the number in attendance, but by the quantity and quality of the teaching actually done, so the most successful fair is that at which the visitors can learn the most.

That county agricultural societies largely through their annual fairs have exerted a highly beneficial influence in the progress of farming is evident from the fact that agricultural progress might almost be said to date from the establishment of such organizations. The first Shorthorn bull that I ever saw, and that was when I was a boy, was purchased and brought into the country where I then lived by the local agricultural society, and with that purchase the improvement of stock commenced which has been there going on ever since. I do not think that the society referred to ever owned another animal of that kind. The improvement of stock soon became a matter of individual enterprise; but not only was it originated by the society, but it was subsequently fostered, rendered more profitable and general, by the publicity which was given to the results attained by means of the society's annual exhibitions. I presume that in very many counties the improvement in cattle, horses, sheep, hogs, poultry, fruits and cereals has had a somewhat similar history, and who can reckon the amount of money that has come into the hands of farmers

in the increased margin of profits that has resulted from these improvements? In the bringing about of these results the agricultural societies have been largely instrumental, and to the men who have earnestly worked for their prosperity and usefulness the community owes a debt of gratitude far greater than it can ever pay. Occasionally we meet a farmer who prides himself on the excellent order and management of his farm. He can point you to his horses, cattle, sheep, etc., and say, "These are quite as good as any of my neighbors, and yet I have never troubled myself nor fooled away any of my time or money with county societies or farmers' clubs." All very true, but when you see such a man, very likely you see one through whose vest the idea of a noble, generous, unselfish act never penetrated; a man whose little soul never seemed to have the capacity for an impulse of generous recognition of indebtedness or obligation toward the men by whose labors he has profited, but whom he has never helped.

Nowhere has progress been more manifest than in regard to improvement in agricultural implements and machinery, and agricultural societies have done much through their annual exhibitions to foster the inventive genius which has proved so great a blessing to the farmer and which the general advancement in society has rendered an absolute necessity.

On the fair ground the farmer has the opportunity of viewing and examining the implements put upon the market by the different manufacturers. He can compare views and experiences with his neighbors in regard to what have been found to be the excellencies or defects peculiar to those that have been tried, and he goes home a richer, because a wiser man, wiser in regard to that practical knowledge which helps him in his work. In consequence of these exhibitions, "mechanical principles are better understood and more intelligently applied." We have combined simplicity of construction with economy of power. A better knowledge of the strength of materials has enabled us to reduce the size of all the parts of farming tools, and so to avoid the clumsiness of the older style of implements, and at the same time, to secure much more effective work.

It would be easy to dwell at much greater length on this part of our subject, but you are met for business rather than to listen to an address, so I will now turn to state briefly what few suggestions I have to make. It is something of a tax upon my modesty to make any suggestions at all, knowing very well that I am speaking to men of far more experience than myself in the management of agricultural societies and the conducting of their annual fairs.

What agricultural societies may reasonably be expected to do for the best interests of farming is simply what they are capable of doing under the wisest and best management.

There are so many things to be taken into consideration in the management of an agricultural exhibition that few, if any, outside of the earnest workers themselves, have any idea of what a tax their management imposes upon the thought and energy of the officers. These officers require to be the most capable and active men, who are in full sympathy with the agricultural interest. I notice that a recent writer on the subject of agricultural societies strongly advocates rotation in office. He claims that many of these societies are afflicted with a "fatal 'ring' consumption," and claims that while rotation might involve some loss of valuable experience, there would be such a gain of popular sympathy and support as would more than counterbalance it. I do not believe it would be best to have any iron clad rule in regard to this matter. Organizations are generally the better for having a proportion of fresh elements wrought into them, but the circumstances are so widely varied, that what would work advantageously in one case, might be disastrous in another. Probably the *via media* or middle way is the best. It is always unfortunate to have such a 'ring' management as would shut out popular sympathy, yet I do not think this is so often the case as the cry of a few malcontents might seem to indicate. On the other hand, a competent officer who adds experience to natural ability, had better be held on to if possible till the society is reasonably certain it can fill his place.

There are one or two features of our agricultural fairs in which I think it will be generally conceded that an advance movement should be made. I will not call it a new departure, for the things to which I have reference are not new either in regard to their advocacy or even in their adoption in some localities.

First, I think every society should at least look forward to the ultimate exclusion of everything from the fair ground that would detract from its primary object as an *industrial exhibition*. In some of the newer counties, perhaps, where the sources of amusement and recreation are very limited; or in cases where the Society is unfortunately struggling under the burden of a debt, it may be deemed excusable to pander to some extent to that popular sentiment which seems to require something to

be done on such occasions that all will admit has no connection with agriculture or any other industry. In no case would it be excusable for the Society to permit under its auspices anything that would tend to corrupt the public morals, but we are alluding now more particularly to things not harmful in themselves but simply foolish or ridiculous, such as climbing a greased pole, running a sack race, catching a greased pig, etc., etc.,—anything that will make us laugh or cry for the moment and afterwards make us ashamed of our silliness every time we recall the fact.

Some such things may perhaps be temporarily tolerated in the interests of revenue, but should be regarded as blemishes that will be left behind and forgotton in the society's more perfect stage. Make the fair all that it can be made as an exhibition of the most perfect specimens of grains and roots, flowers and fruits, horses, cattle, sheep, hogs, poultry and such specimens of various improvements and articles of household utility and adornment as are the best evidences of skill, taste and culture, and I believe all who visit it will find in *the fair itself* the recreation and amusement that they most desire. It has been well remarked that the "legitimate results of wisely applied industry are not restricted and commonplace and unattractive. They are valuable enough to command attention, various enough to awaken interest, curious enough to allure, beautiful enough to please, complicated enough to make people think, and substantial enough to satisfy. No intelligent man or woman, or child ever tires of examining the summer's beauties or the autumn's bounties, ever ceases to admire the wonderful results of culture or to love the works of taste and skill.

"Neither the fragrance of the lily and rose nor the the fair proportions and skillful arrangement of the ripened corn, nor the ruddy or golden or white colors and strange forms of edible roots, nor the tempting sweetness and aroma of delicious grapes and pears ever palls or cloys. And the unsolved mystery will interest our children as it does us, how such beauty and purity and perfection can come forth from the unseemly ground."

Again, I am of the opinion that an advance movement should be made to make the annual fair more of an educator, at least in the art if not in the science of farming.

County societies should bear in mind that the State has made provision for the publication of the more important results of their labors, so that whatever information of value there may be connected with these results may benefit not only the locality where they have been obtained, but also the whole State. A fair should never fail to develop results and facts worthy of permanent record in the annual report of the secretary of the State Board of Agriculture. But a small percentage of these societies furnish anything for this report, and the greater proportion of those that do furnish merely a bald statement of the financial condition of the society and perhaps the number of entries at the fair and the number and amount of premiums awarded.

Some system should be adopted by which the facts connected with the production of the article or animal on which a premium is given should be obtained for permanent record. Suppose for example an exhibitor enters for competition a specimen of some variety of potatoes. Let a card be attached giving the name of the variety, the kind of soil on which it was raised, the method of culture, the time of planting and harvesting, etc. And if that variety or specimen takes the premium, let the awarding committee state in what particular quality or qualities it excelled the other varieties or specimens entered. If it is an animal that takes the premium we should know the breed, the method of its treatment, its peculiar points of excellence wherein it is more valuable than others—if it is a specimen of dairy produce; we want to know not merely that Mr. A. took the first premium, but we want to know what breed of cows he keeps, and what are their distinguishing characteristics, what and how they are fed, and what is the cost of care and of feed as compared with the income—also whatever information might be of value connected with the making and preservation of the article. Such knowledge would be of great value, and it should be the aim of every agricultural society to obtain and disseminate it. "Our progress in agriculture," says Mr. Klippart, of Ohio, "depends entirely upon the accumulation and dissemination of authentic facts. The Germans and their descendants the Lowland Scotch have made more rapid progress in agriculture than any other nation. They too encountered the same difficulties in obtaining precise and well authenticated information, and therefore adopted a different system in part. They retained the system of prizes or premiums; but instead of having a miscellaneous exhibition, they held in one locality an exhibition of horses, in another of cattle, and so on. The committees are paid for their services; their reports are able documents, and I am free to confess that I have learned more with regard to special topics from these committee reports than I have from agricultural text books. Here we practically ignore all committee reports." He adds: "I mention these things not in a

fault-finding or captious spirit, but to demonstrate that in the present condition of things our progress must necessarily be very slow." I would say for myself that I have desired especially to bring this point before you, as I feel very desirous that the reports from county societies might be made much more valuable than they are.

I have one more suggestion, and with this I close: The county society should seek not merely to foster and encourage every branch of industry in the locality, but also to encourage all classes of community, male and female, old and young, and my closing words shall be a plea in behalf of the boys. I have often thought that the boys on the farm are not as much brought out and encouraged as in many other situations. How seldom you hear of a farmer taking his son into partnership or giving him any interest in the business with him until circumstances really compel it. I have no doubt many a young man has left the old home and abandoned the occupation of farming because he felt that to remain was to prolong indefinitely the period of his minority. Now, is there nothing the county society can do for the boys? Why should not they be encouraged to compete for premiums as well as their fathers? The question, I think, is worthy of consideration. I have no doubt but that to extend to the boys some such recognition of their importance in carrying on the work of the farm, as would be involved in their competing for a premium at the fair, might prove just the encouragement needed to give them an interest in their work, and keep them on the farm, where in nine cases out of ten they will be vastly better off than anywhere else. I was much pleased to see in the last number of the "New England Farmer" that a Mr. Allen, of Boston, offers the following special premium: "With an earnest desire to encourage the farmer's boys, I propose to offer the following prizes to boys of York County, Maine, of sixteen years of age and under: To the boy who shall raise the most Indian corn on one-eighth of an acre of land in the year 1879, one hundred dollars; to the boy who shall raise the next largest quantity, fifty dollars; to the five boys who shall raise the next largest quantity, ten dollars each." Then follows a statement of the conditions under which the award is to be made. The last of these conditions is specially worthy of notice. "At the end of the season each contestant shall make and sign a full report giving shape, description and location of land, when planted, when and how many times hoed, when stalks were topped, if at all, when harvested and how much is raised, and as nearly as can be estimated, the value of manure and number of days' labor spent upon the crop." I trust that many may follow Mr. Allen's example, for such encouragement of the farmer's boys would undoubtedly be productive of much good.

Gentlemen, I thank you for your courtesy and attention. The suggestions I have made, though those of one much less experienced than yourselves in the matters to which they relate, are from one who has a high appreciation of your work. Make your societies all that they can be made to promote the various industries worthy to be fostered and encouraged, and as the exponents of the best results in each, and your work will be wide and lasting in its influence, and will be seen in the progressive improvement of many a farm and workshop, and in the increased comfort and adornment of many a rural home.

A vote of thanks was tendered to secretary Baird, for his able address, and a copy of the same was requested for publication in the transactions of this association.

Secretary Baird extended an invitation to the convention, which was accepted, to visit the Agricultural College at 1:30 P. M., to-day.

Secretary Little then read the following communication:

MICHIGAN STATE AGRICULTURAL SOCIETY,
Executive Committee in Session.
MICHIGAN EXCHANGE, DETROIT, Jan. 15th, 1879.

To the President of the Convention of Delegates from County Agr'l Societies of Mich.:

SIR,—I am directed to inform you that Executive Committee, having learned that the annual convention of delegates of county agricultural societies of the State is now in session at Lansing, have adopted the following resolution, and have appointed Mr. Cobb, of Kalamazoo, Mr. Childs, of Washtenaw, and Mr. Howard, of Pentwater, as delegates to represent the Michigan State Agricultural Society in your convention.

Mr. Baxter offered the following resolution:

WHEREAS, The County Agricultural Societies of Michigan have a State organization which meets at Lansing this Wednesday evening;

AND WHEREAS, All such County Societies are by the constitution of this Society made auxiliary to it, and more close and intimate relations between such societies and the Michigan State Agricultural Society are desirable, to the end that all these organizations having in view the same great object of developing the agricultural, pomological, manufacturing and industrial interests of the State, may act in harmony; therefore,

Resolved, That the greetings of the State Agricultural Society be and they are hereby extended to the State organization of County Societies.

Resolved, that a committee of three members of this Executive Committee be appointed to attend the meeting of said State organization of County Societies to represent this Society.

The President named as such committee, Messrs. Childs, Cobb and Howard.

I am very respectfully yours,

R. F. JOHNSTONE, *Sec'y.*

Secretary Little, chairman of committee, submitted the following report upon order of business of the convention, which was adopted:

1. Rules and regulations of societies.
2. Equitable division of prizes.
3. Special prizes.
4. Appointment of viewing committees.
5. Officers competing for prizes.
6. Rule of competition defined.
7. Complimentary tickets.
8. Exhibitors and employés—privileges to.
9. Entries and time of closing.
10. Life memberships.
11. Pedigrees.
12. Reports of standing committees.
13. Election of officers.
14. Miscellaneous.

President Glidden then announced that the business of the convention would be taken up under the general order as adopted:

Secretary Baird offered a resolution, which was adopted, urging it as a duty of county agricultural societies in the offering and distribution of their premiums to give equal encouragement and fostering care to all the various industries represented in the community.

Secretary Little offered a resolution, which was adopted, declaring that a membership ticket should not be an admission ticket.

C. H. Richmond, of Washtenaw, offered a resolution, which was adopted, recommending that agricultural societies encourage the giving of special premiums by individuals, for animals, articles manufactured, works of art or industry, under their rules.

C. L. Whitney, of Muskegon, offered a resolution, which was adopted, providing that prizes or other legitimate means should be used to bring out more statistical information regarding the cost of the production of crops and other articles at our fairs.

Some time was spent in discussing the appointment of viewing committees, but no definite action taken.

The association then adjourned until 7 o'clock P. M.

[At 1:30 P. M., four large double sleigh loads of delegates visited the State Agricultural College and farm some three miles out of the city. The members were very cordially received by president Abbot, and put in charge of the superintendent or foreman, who escorted the delegates, and pointed out and explained all the various departments of the institution. Order and neatness reigned supreme everywhere, while on every hand were found abundant evidences of the faithfulness with which the various officers in charge were dis-

charging their respective duties. The visitors returned to the city at about 5 p. m., well pleased with the results of the expedition.

Thursday Evening, January 16.

The convention resumed the general order. The first subject brought up was that of officers competing for prizes. The subject was freely discussed.

Mr. Richmond offered a resolution, which was adopted, declaring it to be the sense of the convention that it is inexpedient for agricultural societies to prohibit officers of the society from being competitors for prizes.

The rule of competition was then defined. J. Webster Childs and secretary Little made some extended remarks. The point of discussion seemed to be whether one exhibitor should be entitled to 1st, 2d, and 3d prizes in the same class. The discussion was finally closed by J. N. Smith offering for adoption rules 17 and 18 of the Central Michigan Agricultural Society, which were adopted as follows:

Judges will not award premiums to unworthy animals or articles in any case. Where there is no competition, judges will not award premiums except the animals or articles exhibited are meritorious."

The matter of complimentary tickets was discussed, and the general opinion seemed to be that they should only be issued as interchanges between societies and for the press.

The issuing of passes to exhibitors and employes being the next topic, after full discussion, was settled by the adoption of a resolution offered by B. B. Baker, providing that the issuing of passes for general purposes to exhibitors or their employés be discouraged.

The next topic was the time for closing the entries at fairs. L. B. Potter offered a resolution recommending as the uniform practice of all agricultural societies as soon as possible that the entries shall be made and the entry books closed on the day prior to commencing the fairs of such societies. David Woodman deemed it inexpedient if not impracticable in many places to observe such a rule rigidly, and offered an amendment that the entry books be closed, so far as practicable, before the opening of the fair. The resolution, as finally adopted, provides that all entries shall be made and the books closed not later than the evening of the first day of the fair.

The convention then adjourned until 9 o'clock Friday morning.

Friday Morning, 9 A. M.

GENERAL ORDER.

Mr. Woolsey, of Calhoun, moved that the issuing of life membership tickets by agricultural societies be discountenanced, and that where they exist, societies should make an effort to take them up. Adopted.

Mr. Mann, of Lenawee, moved that in county societies we do not deem it expedient to confine judges to pedigrees in making awards regardless of merit, unless the entry be made at least two weeks prior to the fair, so that the correctness of the pedigree may be investigated. Adopted.

Mr. Whitney, of Muskegon, moved that diplomas should be held and considered, as among the highest awards given by any society, and that they should in no case be classed among inferior prizes. Adopted.

Secretary Little submitted report upon form of statistical blanks, which was adopted as follows:

1. Name of society.
2. Fair, where held.
3. Whole number of exhibitors for the year.
4. Total receipts.
5. Total amount offered in prizes.
6. Total amount awarded in prizes.
7. Total of contingent other than prizes.
8. Paid for permanent improvements.
9. Indebtedness, if any.
10. Paid upon indebtedness.
11. Total value of property owned by your Society.

David Woodman, of Van Buren, chairman of committee on legislation, submitted the following report, which was adopted:

Your committee on legislation are of opinion that as the boards of supervisors are authorized by law to levy a tax for the purpose above specified, and as they are the representatives of the people and are presumed to know, and do endeavor to carry out the wishes of their constituents; therefore, your committee are of opinion that it would not be advisable at present, to ask our legislature to amend the law in regard to that matter. Your committee believe that no such amendment as contemplated, would be enacted by our Legislature.

Respectfully submitted.

D. WOODMAN,
J. J. ROBISON,
M. B. HINES,
Committee.

Mr. Whitney, of Muskegon, moved that an effort be made by the committee on legislation in conjunction with the State Agricultural and State Pomological societies to procure the printing of additional copies of the reports of State Board of Agriculture and Pomological Society, and also to secure suitable accommodations for an agricultural department in the new capitol.

Adopted.

Mr. Whitney, of Muskegon, chairman of the committee upon organization, submitted the following report, which was adopted:

ARTICLES OF ASSOCIATION.

(Amended.)

1. This association shall be called The Association of Agricultural Societies of Michigan.

2. The object of this association shall be to establish a more uniform system of conducting agricultural fairs, to adopt such general rules and regulations as shall best secure the greatest good of agricultural societies; for the interchange of views and experiences, and the free discussion of all topics of general interest.

3. Each agricultural, horticultural, and all kindred societies of the state, shall be entitled to representation in this association to the number of three delegates from each organization, and three votes upon any question that may be taken. Officers and members, other than delegates, of agricultural and kindred societies of the state are cordially invited to attend its annual meetings and participate in its deliberations.

4. The officers of this association shall consist of a president, vice president, secretary and treasurer, and three members of an executive committee, which with the president and secretary shall constitute an executive committee of five. Officers shall be elected annually by ballot, and hold their respective positions until their successors are duly chosen.

5. The annual meetings of the association for general business, election of officers, etc., shall be held at such time and place as the previous meeting, or a majority of the executive committee may direct. Intermediate meetings may be called by the executive committee or a majority of them at such other times and places as they may deem advisable.

6. The constitution and by-laws of this association may be amended at any annual meeting by vote of the delegates thereof.

BY-LAWS.

1st. Officers shall perform such duties, subject to the control of the Association, usually required in similar organizations. The Executive Committee shall have the general oversight and management of the business of the Association in the interval between its meetings. The President shall appoint at the opening of each annual meeting the following standing committees: On Topics and Arrangement of Business; on Legislation, and such other committees as the meeting may direct.

2d. The order of business at the annual and other meetings shall be:

1. Address by the President.
2. Report by the Secretary.
3. Appointment of Standing Committees.
4. Address by some person previously chosen.
5. Report of Committee on Topics.
6. Report of Committee on Legislation.
7. Unfinished Business.
8. New Business.
9. Election of officers.

3d. Each society is requested and expected to contribute the sum of one dollar annually to aid in defraying the necessary incidental expenses of the association.

The Association then made choice of officers for the ensuing year as follows:

President—Charles H. Richmond, Ann Arbor.
Vice-President—C. L. Whitney, Muskegon.
Secretary and Treasurer—Frank Little, Kalamazoo.
Ex. Committee, { I. H. Butterfield, Jr., Lapeer. M. B. Hine, Austerlitz. D. D. Antes, Centreville.

A vote of thanks was extended to officers of the Agricultural College and to Rev. L. B. Potter, of Lansing, for courtesies extended.

Ann Arbor was selected as the place for the next annual convention.

Convention then adjourned.

A. C. GLIDDEN,
President.

FRANK LITTLE, *Secretary.*

Kalamazoo, January 20, 1879.

ASSOCIATION OF AGRICULTURAL SOCIETIES OF MICHIGAN.

The following table embraces all the *known* organizations in the State, with such statistical information in regard to each as the Secretary was enabled to gather in response to circulars sent to all since the Lansing convention. It is hoped that hereafter the Societies of the State will respond more fully to this feature or the work of the Association.

FRANK LITTLE, *Sec'y.*

Kalamazoo, Mich., March 1, 1879.

TABLE giving Date of Organization, Name of Agricultural Society or Association, Place of Holding Annual Fairs and P. O., and the Number of Exhibitors. Receipts, Prizes Offered and Awarded, Contingent Expense, Amount Paid for Permanent Improvements, Indebtedness, the Amount Paid on Indebtedness, for 1878, and Value of Property Owned by Society.

Date of Organization.	Name of Society or Association.	Place of Holding Annual Fairs and Post Office.	No. of Exhibitors in 1878.	Total Receipts for 1878.	Amount Offered in Prizes for 1878.	Amount Awarded in Prizes for 1878.	Total of Contingent or Running Expenses 1878.	Amount Paid for Permanent Improvements 1878.	Indebtedness 1878.	Paid on Indebtedness 1878.	Value of Property Owned by Society.
	Agricultural College and State Board Agriculture	Lansing									
1848	State Agricultural Society	Detroit									
1870	State Pomological Society	Detroit									
1873	Alcona County Ag'l Society	Harrisville									
1873	Allegan County Ag'l Society	Allegan									
1842	Adrian Horticultural Society	Adrian									
1873	Armada Agricultural Society	Armada									
1856	Barry County Ag'l Society	Hastings		$1,667 65	$900 00	$734 55	$1,452 67				$3,500 00
1866	Bay County Ag'l Society	Bay City	300	2,000 00	1,000 00	1,000 00	1,000 00	$1,500 00			8,000 00
1850	Berrien County Ag'l Society	Niles	134	1,686 58	1,618 00	1,176 00	21 55	100 00	$2,000 00		4,000 00
1865	Benzie County Ag'l Society	Benzonia									
1851	Branch County Ag'l Society	Coldwater		2,682 61		1,450 00	706 00	230 00	750 00	$296 84	6,000 00
1874	Brighton Market Fair Associ'n	Brighton									
1848	Calhoun County Ag'l Society	Marshall	750	2,421 20	1,575 00	1,013 00	597 20	115 00			10,000 00
1850	Cass County Ag'l Society	Cassopolis		683 20	1,300 00	540 00	181 34				4,612 00
1866	Central Michigan Ag'l Society	Lansing									
1873	Deckerville Dist. Ag'l Society	Deckerville									
1855	Eaton County Ag'l Society	Charlotte	433	3,100 00	1,458 50	900 50	704 42	505 57	2,800 00	700 00	6,000 00
1865	Exp. Ag'l Association of Ionia, Montcalm, etc.	Otisco									
1871	Eastern Michig'n Agricultural and Mechanical Association	Ypsilanti									
1858	Fenton District Ag'l Society	Fentonville									
1850	Genesee County Ag'l Society	Flint	372	2,926 74	2,000 00	715 00	531 00	1,050 00	3,800 00	480 00	10,000 00
1866	Gratiot County Ag'l Society	Ithaca									
1868	Grand Traverse County Ag'l Society	Traverse City	1	605 00		100 00	216 00	1,700 00	1,300 00		2,500 00
1874	Grand River Valley Horticultural Society	Grand Rapids									

TABLE giving date of Organization, etc.—(CONTINUED.)

Date of Organization.	Name of Society or Association.	Place of Holding Annual Fairs and Post Office.	No. of Exhibitors in 1878.	Total Receipts for 1878.	Amount Offered in Prizes for 1878.	Amount Awarded in Prizes for 1878.	Total of Contingent or Running Expenses 1878.	Amount Paid for Permanent Improvements 1878.	Indebtedness 1878.	Paid on Indebtedness 1878.	Value of Property Owned by Society.
1851	Hillsdale County Ag'l Society	Hillsdale	869	$5,629 98	$4,000 00	$1,874 70	$929 01	$800 00	$1,369 38	$1,369 38	$30,000 00
1871	Hubbardston Central Fair Association	Hubbardston	250	2,900 00	1,910 50	1,500 00	675 00	....	....	....	5,000 00
1854	Ingham County Ag'l Society	Mason	500	1,474 43	1,400 00	793 50	95 00	45 00	1,700 00	100 00	4,500 00
1856	Ionia County Ag'l Society	Ionia	...	....	....	....	....	....	....	....	....
1852	Jackson County Ag'l Society	Jackson	494	5,420 00	2,000 00	1,942 00	1,986 55	....	....	....	20,000 00
1845	Kalamazoo County Ag'l Society	Kalamazoo	326	2,572 31	1,824 50	1,374 00	1,235 99	....	....	....	1,500 00
1848	Kent County Ag'l Society	Grand Rapids	385	4,104 00	3,100 00	3,000 00	....	....	4,900 00	....	60,000 00
1871	Lake Shore Ag'l and Pomological Society	Saugatuck	...	....	....	....	....	....	....	....	....
1858	Lapeer County Ag'l Society	Lapeer	300	675 00	535 00	267 50	270 00	....	....	....	160 00
1849	Lenawee County Ag'l Society	Adrian	382	2,106 41	2,072 25	975 25	568 70	....	....	....	573 76
1852	Livingston County Ag'l Society	Howell	286	1,447 70	1,500 00	1,074 50	543 41	....	1,245 69	....	5,000 00
1870	Mason County Ag'l Society	Ludington	...	....	....	....	....	....	....	....	....
1850	Macomb County Ag'l Society	Mt. Clemens	338	1,332 55	1,600 00	698 00	647 29	....	....	....	200 00
1874	Mecosta County Ag'l Society	Big Rapids	1	235 00	200 00	233 25	218 00	....	216 00	....	....
1875	Michigan Central Union Fair Association	St. Louis	...	....	....	....	....	....	....	....	....
	Monroe County Ag'l Society	Monroe	175	2,409 52	650 00	423 66	150 00	2,259 52	5,741 00	....	8,000 00
	Muskegon County Ag'l Society	Muskegon	108	1,287 02	2,355 00	868 00	336 81	1,058 15	1,145 00	....	10,000 00
1871	N. Branch, Burlington, etc., Agricultural Society	North Branch	...	....	....	....	....	....	....	....	....
	N. Berrien and Michigan L. S. Agricultural Society	....	...	....	....	....	....	....	....	....	....
	Newaygo County Ag'l Society	Newaygo	...	....	....	....	....	....	....	....	....
1849	Oakland County Ag'l Society	Pontiac	336	2,238 05	2,000 00	1,738 00	700 00	1,004 72	3,700 00	700 00	10,000 00
	Oceana County Ag'l Society	Hart	300	641 35	325 00	288 25	241 13	200 00	900 00	....	2,000 00
1867	Ontonagon County Ag'l Society	Ontonagon	...	75 00	....	....	....	....	....	....	250 00
	Osceola County Ag'l Society	Evart	112	482 84	650 00	176 00	115 27	246 94	....	....	800 00

1856	Ottawa and Muskegon Ag'l Society	Berlin	...	...	...	...	...	...	...	...	...
1870	Paw Paw Valley Ag'l Society	Lawrence	...	...	...	...	...	...	...	...	...
1873	Springport Union Ag'l Society	Springport	...	...	...	...	...	...	...	...	...
1849	St. Joseph County Ag'l Society	Centreville	...	5,548 06	4,000 00	2,889 25	1,900 25	...	...	...	5,000 00
1868	Sanilac County Ag'l Society	Lexington	104	353 77	410 00	220 50	60 80	41 23	...	...	1,200 00
	Saginaw County Ag'l Society	East Saginaw	258	1,814 02	...	954 99	822 86	...	...	...	...
1876	Sanilac Central District Ag'l Society	Farmers	...	...	...	...	...	...	...	...	...
1870	South Haven Pomological Society	South Haven	...	...	...	...	...	...	...	...	...
1866	Tuscola County Ag'l Society	Watrousville	...	...	...	...	...	...	...	...	...
1874	Union Ag'l and Industrial Society	Plainwell	224	2,409 63	1,064 75	905 75	691 96	375 00	147 00	463 19	3,500 00
	Union Ag'l Society	Fremont Center	232	144 00	157 00	150 00	143 00	...	...	...	...
1850	Van Buren County Ag'l Society	Paw Paw	...	2,505 49	700 00	750 00	200 00	185 00	2,800 00	500 00	8,000 00
1847	Washtenaw County Ag'l Society	Ann Arbor		3,033 18	2,000 00	1,339 75	472 72	1,174 89	3,300 00	665 00	8,000 00

EATON COUNTY.

To the Secretary of the State Board of Agriculture:

On making a report of the doings of the Eaton County Agricultural Society for the year 1878 I hardly know where to begin, inasmuch as no previous report of record has ever been made to the State Agricultural Society of its doings in former years. I will therefore, before proceeding with the report for the current year, give a brief outline of its organization and history up to the 31st of December, A. D. 1877:

On the 3d day of January, A. D. 1855, pursuant to notice, a meeting of citizens of the county met at the court-house in the village of Charlotte for the purpose of organizing a county agricultural society. Willard Davis, of Vermontville, was elected chairman of the meeting and L. H. Ion, of Charlotte, secretary.

A resolution was adopted to organize the Eaton County Agricultural Society, whereupon a committee of three, consisting of Harvey Williams, J. C. Spencer, and L. H. Ion was appointed to draft a constitution and by-laws for the society and then adjourned to meet February 12th following.

Pursuant to adjournment a meeting was held, the committee reported and the report was accepted and adopted.

The first officers of the society (who were elected at this meeting) were W. U. Benedict, of Vermontville, President; L. H. Ion, of Charlotte, Secretary, and Harvey Williams, of Charlotte, Treasurer.

The first fair was held in the village of Charlotte Oct. 11th and 12th, A. D. 1855, the citizens of the village furnishing the grounds, buildings and fences the first year free of cost to the Society. The total amount of premiums awarded was $194.

In May the following year the Society purchased eight acres of ground at a cost of seven hundred dollars, which was enclosed with a suitable fence, and buildings for the accommodation of exhibitors erected. The cost of buildings and fence does not appear on the records. Amount of premiums awarded for the year 1856 were $230.25.

Annual fairs have been held every year since with increasing success, showing by the increasing number and quality of articles and animals exhibited the interest taken by farmers and mechanics in the success of the society, and its influence in encouraging and developing the agricultural resources of the county.

In the year 1868 it became apparent that the needs of the society demanded more room, whereupon the necessary arrangements were made to sell the old grounds and purchase others and in a more suitable location. The old grounds were sold on the 19th day of June, A. D. 1869, for $3,000 and the new, containing thirty-five acres, were purchased at a cost of $3,875, upon which there have been expended in a half mile track, buildings and fences about $5,500.

The new grounds are located in the south part of the late village (now city) of Charlotte, well planned and laid out with walks and drive-ways to and through a splendid natural grove of about ten acres, which occupies the eastern portion of the grounds, and through which runs Battle creek, supplying water for all.

At the time the new grounds were purchased the society assumed obligations

on the same amounting to $3,285, with interest at the rate of ten per cent per annum, using all available means at that time and the following few years in improvements on the grounds.

Since that time the change in values and consequent stringency in all monetary affairs have made it a heavy load for the society to meet its obligations. The indebtedness, however, has been steadily reduced each year for the past five years until on the 31st day of December, 1878, the total indebtedness, including interest, was $2,700, with a balance of cash on hand of $658, leaving net indebtedness $2,042.

The twenty-fourth annual fair was held on the society's grounds September 24th, 25th, 26th and 27th, 1878, and although the fairs of previous years had been proverbially successful, the officers and managers of the present fair had many misgivings as to its success, owing to some changes in rules in regard to tickets of admission to which very many objected, and the prospect of bad weather. The weather the first day was not pleasant, but before night the entries were in excess of any former year. The second day from 10 A. M. to 3 P. M. the rain fell most of the time in torrents and yet the attendance was good. The third day was bright and clear, and although the roads were very bad the Eaton County Agricultural Society's grounds never had so many people on before, and the fourth day was equal to any previous day in the history of the society.

All the departments were full and overflowing with the choicest exhibits in their several classes, and the fair which, at the beginning, promised to be a failure, proved a triumphant success; and I feel that I should be direlict in my duty in this connection if I failed to mention the fact that very much of our success was due to the ladies who took a special interest in the fair, those of the country and city vieing with each other in seeing who should do the most in helping on the good work and make the best exhibits.

The amount of premiums offered for the fair of 1878 was $1,458.50, distributed as follows: Horses, $326.50; cattle, $391.50; sheep, 154.50; swine, $132.00; poultry, $32.25; fruit, $40.25; vegetables, $38.50; grain, $35.25; farm implements and mechanic arts, $109.25; household domestic manufactures, $69.50; household dairy products, $45.50; fine arts, $52.00; plants and flowers, $30.50. There were 162 entries of horses, 91 of cattle, 94 of sheep, 35 of swine, 57 of poultry. The total stock entries 439, and 1,235 miscellaneous entries. Total 1,674, besides entries for the special premiums.

Total amount of premiums awarded, $900.50, besides the special premiums offered by different individuals.

The financial statement of receipts and expenditures for the year ending December 28th, 1878, are as follows;

Balance on hand December 27th, 1877	$188 76
Loaned at bank	90 00
Sale of logs	11 38
Membership tickets sold	1,239 00
Admit one tickets sold	774 00
Vehicle tickets sold	342 50
Grand stand tickets sold	93 60
Rent of stands	331 00
Pasturage	30 10
	$3,100 34

EXPENDITURES.

Paid interest on mortgage	$246 54
Paid insurance	14 40
Paid drawing and sawing logs	21 48
Paid loan and interest at bank	95 54
Paid permanent improvements	505 57
Paid contingent expenses	668 42
Paid premiums	889 50
Cash on hand	658 89
	$3,100 34

The following officers were elected on the second day of the fair to become operative January 1st, 1879:

President—Fitz L. Reed, Olivet.
Secretary—Seth Ketcham, Charlotte.
Treasurer—B. W. Warren, Charlotte.
Directors, three years—Fitz L. Reed, Olivet, M. L. Squier, Vermontville.
Directors, two years—Harris Cooper, Carmel, A. P. Hartson, Eaton.
Directors, one year—Esek Pray, Windsor, H. S. Robinson, Walton.

All of which is respectfully submitted.

SETH KETCHAM,
Secretary Eaton County Agricultural Society.

Dated at Charlotte, January 1st, 1879.

GENESEE COUNTY.

The Annual Meeting of the Genesee County Agricultural Society was held at the Court House in this city, on Wednesday, with a very good attendance. In the absence of the President, the meeting was called to order by Director J. C. Dayton, and C. H. Rockwood, of Genesee, was appointed Chairman.

Before proceeding to any business the chair called attention to the Farmers' Institute to be held in this city next week, and said he was requested to invite all, especially the farmers, to attend.

The Secretary then read his Annual Report, which was accepted and adopted, and is as follows:

SECRETARY'S REPORT.

GENTLEMEN:—We have assembled to-day at our annual meeting, to review the transactions of the Society for the past year, and to see if any advancement has been made in the object for which Agricultural Societies are formed. While we may be unable to show any increase in the number of entries, it is gratifying to know that we have not deteriorated.

In the wisdom of an All-Wise Providence, we have been blest with another year of bountiful harvest. The yield of the productions of the soil has again been a large one; the average of wheat per acre was perhaps a little under the year 1877, but a larger number of acres were sown, as statistics show, in the aggregate an excess, while the quality compares favorably.

The oat crop, in our opinion, has been a fair one. If we were to judge by the market price, we would say that there had been an over-production, but as the tendency in price has been downward for all kinds of produce, we can not therefore safely say, that augmentation is the cause.

RYE AND BARLEY.

The productions of these two classes of produce is very small in this county. There being comparatively no demand for home consumption, it would have to seek remote markets; and as we are unable to compete with the western States, the question has undoubtedly arisen ere this, whether a profitable source of revenue could be realized from raising this kind of produce.

CORN.

The crop in this variety of produce will compare favorably with other kinds of grain. Some very fine specimens of the common yellow, and white and yellow Dent, were exhibited.

STOCK.

We think we can safely say that the exhibition of stock at our last Fair, as regards quality, was never excelled in this county. The exhibition of Short-horns was exceedingly fine, which is evidence that our breeders in this county are continually improving their herds in quality. The principal exhibitors in this class were Geo. W. Stewart, of Grand Blanc, William Hamilton, of Flint, Thomas Shaw, of Mundy, and John Joy, of Atlas, who are taking a front rank with other and older breeders in this State.

The exhibition of Devons was very small. We believe this breed of animals are continually becoming more unpopular, not only in this county but in this country, in general. The only exhibitors in this class were, Thomas Foster of Burton, and D. S. Halsted of Clio.

The exhibition of Herefords was of fine quality, though small in number,—by Thomas Foster of Burton, although we have in this county a very large and successful breeder of this class, Wm. W. Crapo, who has not of late years exhibited at our fairs, but is constantly receiving orders and supplying, to a considerable extent, the breeding ranches of the far West.

As Genesee county is not noted for its dairy farms, therefore we could not reasonably expect a very large exhibition of Jerseys or Ayrshires. There were, however, small but fine exhibits of Jerseys by William Hamilton of Flint, likewise Ayrshires by LeRoy Parker of Burton, and William Western of Flint.

HORSES.

The exhibition in this department was not as large or interesting as we had hoped to see, nor was there as much interest manifested as the lover of horses would like to have seen. The lack, we think, arises from the fact that but little interest has ever been taken in breeding and raising in this county the noblest of all animals, Messrs. Nye & Foster, Dayton, Hamilton, and Howard, being exceptions, and their stock is as yet too young to attract general notice, but gives great promise for the future. They were among the largest exhibitors, and their stock was greatly admired. The stables of Messrs. Dewey & Stewart, of Owosso, were represented by the noted stallions, "Louis Napoleon," "Joe Gavin," and "Jerome Eddy," and received very general notice. They have done much toward improving the class of horses in their county, and the result is, they have acquired a national reputation for producing fine horses.

It is a notable fact that the majority of our farmers in this county have taken but little interest in the breeding of well-bred horses. There is not in this county one pair of closely matched, good sized carriage horses that would attract any notice whatever in any market. The same can be said of draft horses, which should be bred extensively in this county, as a large revenue might be realized from this source, in supplying the demand for this class of horses for the lumbering districts, and we earnestly hope that our farmers will hereafter give the matter of breeding horses the attention it seems to merit. There was more or less criticising or condemning the judgment of awarding committees in this department. To this class let us say, that Viewing Committees may be partial, and may err in their judgment, and the Society be condemned in consequence. Notwithstanding it is and has ever been the aim of the Society to select judges who would be impartial in their verdict, and if those selected would present themselves, the Society thereby becoming relieved from selecting judges from among the visitors, undoubtedly more satisfaction would be given.

SHEEP.

We believe it has become a settled fact that the most profitable variety for sheep husbandry in this country are the thoroughbred and grade Merinos; they are the principal race of well bred sheep in the United States to-day, the wool being in greater demand, and at a larger price. They will thrive better upon the same number of acres or require less sustenance than the Leicesters or Cotswolds. Large numbers of Merino stock rams have been shipped to Colorado by some of our principal breeders in this county. The principal exhibitors in this county were D. P. Dewey, O. C. Beals, Henry Tyler, H. F. Hill, and J. H. Thompson. In Southdowns, Thomas Foster and Sumner Howard; in Leicesters and Cotswolds, L. H. Roberts. Messrs. Beals, Dewey and Hill also exhibited some Delaine sheep.

SWINE.

The exhibition of Poland-Chinas and Berkshires were numerous and very fine. Much credit can be given the breeders for the improvement they have made in this class. The exhibitors were A. W. Alger of Mundy, Thomas Foster of Burton, Harvey Noble of Flint, Wm. H. Smith of Richfield, Adelbert Schram of Burton, Orlo Danser of Flint, C. L. Barnhart of Flint, Thomas Shaw of Grand Blanc, and G. M. Curtis of Flint.

POULTRY.

Notwithstanding the fact that it is an unfavorable season for the show of poultry, there was a very fine exhibition. The exhibits were large and meritorious. There was also a fine exhibition of minor pets.

FRUITS.

It is with great pleasure that we are able to announce a very extraordinary fine exhibition in this department as regards quantity and quality. Our display in this class, we think, would compare favorably with that of our State Fair, which is evidence that Genesee County is not only adapted for this variety, but is not behind in the productions of the choicest varieties.

The exhibition of butter, cheese, canned fruit, etc., were, as usual, large and very fine.

A very fine exhibition of cassimeres and flannels was made by Messrs. Stone,

Atwood & Co. Indeed the business of their establishment has grown to a considerable magnitude. The reputation they have acquired in the quality of their goods, and of the prices to suit the times, has become very wide, and prosperity for the future, as in the past, must follow in consequence.

The display of ornamental needle work made in Floral Hall, was very extensive and attractive. It is very gratifying to the society to know that the interest taken by the ladies is yearly increasing. We regret that time and space will not allow us to give a detailed account of the many beautiful specimens exhibited in this line. There were also very elegant exhibits in their various lines by Messrs. Aitken & Co., F. H. & E. O. Pierce, E. K. Jenkins, N. W. Crawford, M. F. Elmore, Warner Lake, M. Davison, Orrin Safford, Dullam Bros., H. Wilson, Thos. Symons & Son, and the Drummond Gas Light Machine, by Millard & Hamilton. The exhibition of oil paintings by Mrs. W. L. Gibson was very artistic, and was very much admired. The execution proves that we have in our midst amateur talent of no mean order. Another interesting feature in this department was the exhibition of French and German chromos and steel engravings by Mr. H. C. Hartwell, which added very much to the attraction in Floral Hall. Very much larger exhibits would undoubtedly have been made in this department had the society a larger and more commodious building, which is very much needed.

There was a very large exhibition of carriages and buggies made by Mr. W. A. Paterson, and Mr. Beach of Linden.

The display of agricultural implements at our last fair was, as usual, very creditable.

The improvements made in farm machinery is fully in keeping with the demands of our most modern and thrifty farmers. The knowledge and ability of agricultural implement manufacturers in anticipating the wants of the public is certainly highly commendable. The exhibitions of malleable iron by the Genesee Iron Works was all worthy of notice, the workmanship of first quality, which accords them a position in the front rank with the iron manufacturing establishments in the state.

Herewith we give the total number of entries in each class:

Class.	Entries.
1. Shorthorned Durhams	48
2. Devons	9
3. Herefords	13
4. Ayrshires	5
5. Three-fourths blood and high grades	20
7. Working oxen and steers	5
8. Fat cattle	2
9. Sweepstakes for cattle	1
10. Thoroughbred horses	3
11. Roadsters	72
12. Carriage and single horses	7
13. Horses for general purposes	30
14. Draft horses	13
15. Farm teams for general purposes	6
16. Sweepstakes for horses	3
17. Jacks and mules	1
18. American merino sheep	20
19. Delaine sheep	8
20. Southdowns	14
21. Leicester and Cotswolds	3
22. Fat sheep	2
23. Sweepstakes for sheep	2
24. Swine	22

Class.	Entries.
25. Poultry	162
26. Field crops	39
27. Fruit	280
28. Vegetables	61
29. Butter, cheese, bread, etc.	78
30. Flowers	22
31. Domestic manufactures	11
32. Hosiery	16
33. Ornamental needle work	143
34. Works of art	35
35. Foreign and domestic manufacturer's list	39
36. Carriage and farm implements	46
37. Farm and domestic implements	17
38. Leather and its manufactures	8
Total number of entries	1,266

The annual election of officers was held at the court-house in the City of Flint, on Wednesday, January 9th, 1878, and resulted in the election of the following officers:

President—Thomas Foster, of Burton.
Secretary—H. C. Van Deusen, of Flint.
Treasurer—Geo. W. Hubbard, of Flint.
Directors—L. G. Hitchcock of Genesee, J. C. Dayton of Flint, C. H. Rockwood of Genesee, Dexter Horton of Fenton.
For one year to fill vacancy—Henry Schram of Burton.

All of which is respectfully submitted.

H. C. VAN DEUSEN, *Secretary.*

This was followed by the Treasurer's report, which was accepted and adopted, and is as follows:

TREASURER'S REPORT.

Statement of moneys received and disbursed by present treasurer for 1878:

RECEIPTS.

From former treasurer	$207 07
Genesee county	270 00
Base ball clubs	3 50
Gate and grand stand—1st day	257 50
" " 2d day	1,630 53
" " 3d day	520 34
Court street M. E. church	15 00
H. R. Dewey, dinner tickets	1 35
L. J. Hitchcock, hay	1 00
Secretary	17 95
Rent of shed	2 50
Total	$2,926 74

DISBURSEMENTS.

Paid premiums of 1877	$33 25
Thomas Foster, on contract	550 00
Redeeming 53 meal tickets of church	18 55
Loaned Secretary	25 00
Paid Treasurer	50 00
Printing tickets (Mather)	10 80
Paid Wm. Harvey on contract	239 70
Hay of Beahan & &o	86 15
Paid Marshal	21 00
Wm. Hamilton, principal	200 00
Wm. Hamilton, interest	280 00
1878 Premiums	714 26

Expense—		
Cash book	$2 25	
Recording deed	75	
Sperry & Bushnell	75	
Printing (Mather)	10 00	
Posters	32 00	
Drayage	2 30	
Rubber bands	85	
		$48 90
Paid orders		230 74
Dayton's orders		37 85
Hitchcock's orders		82 00
Hubbard's orders		30 75
Rockwood's orders		6 00
		$2,664 95
Balance on hand		261 79
		$2,926 74

GEO. W. HUBBARD, *Treasurer.*

KALAMAZOO COUNTY.

The annual meeting of the County Agricultural Society was held at the Court House in this village on Saturday, January 11th, 1879, at 1 P. M. There was a very fair attendance of prominent farmers of the county. On taking the chair President Cobb announced the first business in order to be the report of the Secretary. Mr. Frank Little, Secretary of the Society, then made the following report:

Mr. President and Gentlemen:

As the Secretary of the Kalamazoo County Agricultural Society, I herewith submit my annual report of the transactions of the Society for the past year.

The gross receipts of the Society, together with a small appropriation from the county, have been sufficient to pay all the premiums and expenses, leaving our financial condition unimpaired.

The fair of 1878 was held at National Park, September 26th, 27th, 28th and 29th. Weather favorable, except a sudden storm of wind and rain Wednesday afternoon, which did considerable damage to articles on exhibition in the various halls. The receipts at the ticket office were largely diminished, a merely nominal sum being received that day.

There were well grounded complaints, I fear, in some of the departments of inadequacy of accommodations, and want of repair of some of the buildings. We can scarcely expect that our citizens will take costly paintings, delicate and valuable articles out of their houses and manufactories, and expose them to injury at the fair ground, for the sake of the small premiums offered.

The general interest of the peopls in the Society is steadily increasing in the county. New names are being added to the membership, and every town is represented in the list of exhibitors.

ENTRIES.

The whole number of entries of animals and articles for exhibition at the fair of 1878 was 1,591, subdivided as follows:

Horses	162		
Cattle	72		
Sheep	82		
Swine	65		
Poultry	79		
		460	
Grain, vegetables, fruits and flowers	614		
Dairy, household, domestic and fancy	273		
Merchandise, paintings, implements, etc	244		
		1,131	
			1,591

PREMIUMS.

The premiums awarded amounted to the sum of $1,361.50, distributed as follows:

Horses—general list	$209 00	
" special "	295 00	
Cattle, general list	188 00	
Sheep, " "	88 00	
Swine, " "	62 00	
Swine, special	10 00	
Poultry	35 75	
		887 75
Grain, vegetables, fruit and flowers	$180 75	
Dairy, household, domestic, etc	118 00	
Merchandise, paintings, etc	145 00	
Special prizes	30 00	
		473 75
Total		$1,361 50

RECEIPTS.

The receipts into the treasury for the year ending Jan. 11, 1879, were as follows:

Business cards in pamphlet, of 1878	$172 00	
Rent of stands on the ground	97 00	
Subscriptions for speed	156 50	
Special class entrances	159 00	
Membership tickets	326 00	
Gate tickets	1,361 75	
Grand stand	68 06	
Cultivator sold (donation)	22 00	
Appropriation from the county	210 00	
		2,571 31
Amount to balance disbursements		37 68
Total		$2,609 99

EXPENDITURES.

The expenditures for the year ending Jan. 11, 1879, have been as follows:

Premium checks, etc., Shearing Festival	$20 00	
Premium checks, Fair of 1878	1,354 00	
D. C. Reed, rent of National Park	400 00	
Printing, stationary and postage	139 57	
Hay and straw	100 00	
Music	75 00	
All other contingent expenses	521 42	
		$2,609 99

FINANCES.

The treasury statement at the date of Jan. 11, 1879, is as follows:

DR.

To cash balance in treasury, Jan. 12, 1878	$1,550 73
To cash receipts from all sources in 1878	2,550 31
	$4,101 04

CR.

By paid check drawn upon the Treasurer, 1878	$2,609 99
By loan to Parvis Pearce, of Climax, April 6, 1878, two years, at 8 per cent, secured by mortgage	1,350 00
By cash on hand Jan. 11, 1879	141 04
	$4,101 04

The subject of procuring suitable fair grounds to be owned by the society is an important question for you to consider. We are now, and have been for the past six years, mere tenants-at-will at National Park. While there has been a constant shrinkage year by year in respect to the extent of the accommodations placed at our disposal; and from lapse of time and want of proper repairs, the buildings, with one exception, have become nearly untenable, the annual rental has appreciated to such a degree as to become onerous in the extreme.

The make-shift policy which we have been following in the past, is unwise and entirely unnecessary. The people of Kalamazoo county can provide ample grounds and buildings for a county or state fair if they will. It is all a question of willingness.

Will they say that it is a matter of no consequence whether we maintain a society or not? That it can be of no practical benefit to any one? That farmers, like poets, are born, not educated in the great school of experience? That agricultural societies, colleges, literature and experimental tests, are useless luxuries, that can readily be dispensed with? That all these modern inventions, and so-called improved methods in farming, are mere devices to get a living without work; and that every honest farmer should stay at home, lock his stable nights, and keep in out of the wet!

The population of our county may be estimated at 38,000. Of this number the agricultural class comprise fully 19,000. It is safe to say that eighty per cent of the entire population and sixty per cent at least of the agricultural portion, do not contribute in any direct way to the support of the society.

At the annual meeting, and the several adjournments thereof one year ago, the subject of fair grounds was very fully considered. An application had been previously made to the county board of supervisors to aid the society in this respect. The statutes of Michigan (see compiled laws of 1871, page 706, chapter 71) empower county boards, at their option, to levy a tax of not less than one-fortieth, or more than one-tenth of a mill upon the dollar, of the aggregate assessed valuation of the county, in aid of county agricultural societies. The society asked for an appropriation of the maximum sum allowed by the law, to wit, one-tenth of the mill on the dollar, to be devoted exclusively to the purchase of grounds; the fee of which should be vested in the county. The application failed in the sense in which it was preferred; but a small sum was voted, which appears in the items of receipts for the past year.

At the meetings last winter proposals were received from a number of parties

to sell the society land. Committees were appointed, who examined several plats and made estimates of the cost of purchase and fitting up. But no person was found public spirited enough to furnish the necessary funds. All agreed that land was wanted; how to pay for it, became at last the leading topic for discussion.

It seemed to be the general sense that the people of the county ought to pay one-half, and Kalamazoo village the other half. And the only regret now is that some sagacious person present did not offer a resolution to that effect, which would have passed unanimously, and thus have rid us of any further trouble in this direction. A committee was chosen, consisting of Hon. Hezekiah G. Wells as chairman, and Hon. James M. Neasmith and Bradley S. Williams, associates, to prepare a bill for enactment at the present session of the legislature, to provide for raising by tax upon the people of the county a sum, not exceeding twenty thousand dollars, for the purchase, or purchase and fitting up of suitable fair grounds for the County Agricultural Society.

If agricultural societies confer no appreciable benefits upon the public; if they do not stimulate to a higher type, to a more rapid development of the science, and to the new methods of farming; if they do not tend to elevate the general tone and thrift of the farming class; to the introduction of improved stock, and new varieties of seeds; to disclose the advantages and resources of the locality, giving us a name and prestige abroad; if they were not in the broadest sense imaginable, public institutions whose sole aim and object is to advance public interest, then in that case, they would have no claim, and the public should not be asked to aid in their support.

On the other hand, if the farmers of the county appreciated the society, its aims and objects; had they faith in the benefits to be derived; that in these years of advanced thought and human progress, it would be disgraceful to be found listless, or to take any step backward; were they fully awake on the subject, we should need no legislative enactments, no tax, no private subscriptions.

There are in this county 1,857 persons owning farms of 80 acres and upwards. If each of these persons would contribute the annual membership fee of one dollar, the revenue from that source alone would amount to $1,857. *We sold 326 memberships this year!*

Societies are forced to resort to all sorts of special attractions, of questionable character and utility to bring out the people. Notorious public characters have been paid five hundred dollars to show themselves on the fair ground for an hour. I treat the "*address*," so-called, as of no perceptible value. In connection with this prostitution to base uses, this resort to questionable expedients, may be classed "tests of speed" of professional or track horses. These horses are kept and used solely for racing purposes, to win prizes at "meetings."

The public interest in the outcome of the pool-box has declined, sensibly, and why should such a large sum, that ought to be apportioned to other departments, be distributed in a direction yielding no beneficial results whatever?

Our attention was called through the public press, by a citizen of the county, the past season, to an alleged inequality in respect to the premiums offered in the list for 1878. He claimed that the article of wheat, the leading staple of the farmers of Michigan, had not been duly recognized, but that, in view of its great commercial value the premium was ridiculously insignificant. The criticism being a common one, made by other people in other departments, I attempted an explanation of the theory of prizes as offered from which I now quote:

If it were true that agricultural societies are organized for the sole purpose of awarding premiums to exhibitors, and that exhibitors are entitled to all the money paid at an annual fair, then it would simply be a question of division upon an equitable basis. Even under this view of the case difficulties would arise; for the farmer, who, with two hired men and two of his boys, leads a fractious bull twenty miles in a hot day, and receives only the paltry award of ten dollars for three days' care of the animal and attendance upon the fair, might well complain that the premium of one dollar and fifty cents to an exhibitor who only came one day and brought one bushel of wheat under his wagon seat, was out of all proportion to the intrinsic value of the two exhibits, the interest the public would take in them, and the trouble and expense incident to the presentation and care of each.

Premiums are incidental, tokens of superiority, rewards of merit. They should be prized, not for their pecuniary value, but as evidences of success, as testimonials fairly won, as the unanimous verdict of a discriminating public. In such a case, the blue ribbon is accepted with all it implies without regard to its money value.

If the fair-going public would be equally well satisfied and interested in stalls full of horses, pens full of sheep, or barns full of wheat, then "the bill of attractions" would be a very simple and easy one.

Tastes differ; people are not all equally interested in the same subject or thing. In order to secure the attendance of the public, fairs must be made in the fullest sense possible expositions, museums, wherein are gathered all the varieties of domestic animals, manufactured articles, inventions, works of art, curiosities, fancy articles, and products of the field, garden, orchard and household.

Wheat is grown upon nearly every farm in Michigan. It is the leading market crop of the State. Farmers will raise it irrespective of premiums, and they need no special encouragement. Varieties of seed, methods of cultivation, fertilizers, land best adapted, etc., are subjects connected with its growth, and can be brought under the observation of the agricultural public through the medium of lectures, essays and various publications of the day.

Few farmers comparatively are willing to devote the time and means necessary to improve materially the breed of animals. Societies have always deemed it a wise policy to encourage the importation and introduction into every locality of blooded or pure stock, and as a general rule, to stimulate any branch of farm industry that might otherwise remain neglected.

Many new varieties of grain have been sent out each year by the agricultural department of the government, to be tested in various localities. The commissioner desires the result of these experiments in each instance, to be sent to Washington. I have been unable to procure any statements from persons testing them in this locality. Under date of July 26, 1878, I wrote the commissioner in substance as follows:

As a general rule it has been a difficult matter to place the seeds where they will receive a fair trial. Usually samples of wheat for instance are planted in some obscure corner where some other crop has failed. The tests are incidental entirely, indifferently made, and usually result in failure. Seeds from remote districts have to become acclimated. French wheats as imported do not ordinarily succeed in our Michigan climate. The Australian and Russian do better, but they improve after the first crop.

Instead of an indiscriminate distribution to farmers, would it not be better to send these seeds to the State Boards of Agriculture of each State, to be tested at an experimental farm by experts, under all the ordinary conditions peculiar to the State. Such as gave promise of success could be re-distributed by the State authorities to a few prominent farmers in each county, and thus the object sought would be more fully and thoroughly secured.

The report of the Committee on Farms was not in readiness to be submitted for publication at the last fair. The committee consisting of Messrs. Bair, Curtiss and the Secretary, unanimously awarded the first prize, for the "best cultivated farm of not less than 120 acres," to Mr. Wm. H. Cobb, President of our Agricultural Society. Mr. Cobb's farm is eligibly situated on one of the main roads leading south, about four miles from the court house in this village. It embraces two hundred and sixty-five acres of excellent farming land, which, with the exception of twenty-five acres of woodland, is all under

thorough cultivation. There are two good farm houses, with the necessary outfit of barns, stables, sheds, etc., for each. Although lying compact in a body, it is really two farms, and can be readily carried on as such. One of the barns is admirably arranged for the comfort and economy of management of the large number of horses, milch cows, fat stock and other animals that can be housed therein.

Mr. Cobb has been eminently successful as a farmer, while he has devoted much time to the prosecution of other branches of business. A brief synopsis of the results of the past year, compiled from a statement on file in this office is herewith submitted:

To Messrs. Bair, Curtis and Little, Committee on Farms:

GENTLEMEN—Having entered my farm to compete for premium, I submit the following statement:

My first purchase, twenty-four years ago, was 165 acres, 35 acres of which was cleared. During the first fifteen years we cleared, mostly with the grub-hoe, about 100 acres. Ten years ago I purchased 100 acres more—the part I now live upon—making 265 acres in the whole farm. We have 240 acres under cultivation and 25 acres in timber. There are two sets of farm buildings complete, and two orchards.

My routine of crops has been generally as follows: Corn planted upon sod-ground, followed with oats; then manured, sown to winter wheat and seeded down with timothy and clover—timothy sown in the fall and clover in the spring, about one bushel of seed of each upon ten acres. In summer-fallowing for wheat we usually follow with wheat the second year, and seed down to grass the same as in the former case. We have from 60 to 90 acres in wheat each year. This year we had 60 acres of wheat, the average yield of which was about 28 bushels per acre, although some fields averaged 33 bushels per acre. Our other crops this year are 35 acres of corn, better than the average this year; 15 acres of oats, a heavy crop; 1½ acres of potatoes, Early Rose injured by drought, Late Rose and Snowflakes good size and will be a fair crop; 40 acres of meadow, yielding about 1½ tons of good hay per acre; 20 acres of clover seed in stack, unthreshed.

In live stock we have six work horses, two driving horses, six colts, one brood mare with foal by side, one bull, eight cows, two two-year-old heifers, six yearlings and five calves. We usually winter from 20 to 25 hogs, selling them in the fall after stubble is cleaned up. Of sheep, we average to keep 300; 175 will be sold for mutton during the winter, the others are breeding ewes and lambs.

Respectfully submitted.

WM. H. COBB.

The committee hardly approve of Mr. Cobb's routine and methods in farming. We found everything pertaining to the farm, buildings, fences, stock, tillage of the fields, etc., in admirable condition and order. We can but commend his course and the success that has crowned his efforts to the careful consideration of the farmers of the county.

The sixth annual convention of the association of agricultural societies of Michigan meets at Lansing the 15th of January inst. The late acting president and secretary of this society should be authorized to represent it as delegates.

In retiring from the office of secretary, a position that I have held for a number of years, I can only say that I have earnestly endeavored to promote the interests of this society, as a means of enhancing the general welfare of the people of this locality: and to enlarge its sphere of usefulness both at home and abroad.

I desire to bear unqualified testimony to the faithfulness with which your worthy president, Mr. Cobb, and the other officers of the society have discharged the duties of their respective stations. A remarkable spirit of harmony and unity of purpose, has pervaded all departments; and the sacrifices that these gentlemen have made to serve the public in the various positions

assigned, richly entitle them to honorable mention, and the grateful acknowledgements of an appreciative community.

We now surrender the official management of the society into your hands, with earnest wishes for its future prosperity.

Respectfully submitted,

FRANK LITTLE, *Sec.*

KALAMAZOO, Mich., January 11, 1879.

The report of the secretary, as above, was, on motion, accepted and adopted.

AWARD OF PREMIUMS ON FIELD CROPS.

Statement of yield of clover seed from one acre.

To the Executive Committee Kalamazoo County Agricultural Society:

One year ago last spring I sowed 10 78-1000 acres of wheat ground with mammoth clover seed, at the rate of five quarts per acre. The ground was dragged once as soon as the seed was sowed. No stock was allowed to run on the young clover in the fall or last spring.

As soon as the young clover commenced to grow in the spring, plaster was sowed at the rate of seventy-five or a hundred pounds per acre, and the clover left to make all the growth it would, which was from four to six feet in length.

About the time it was ready to head out, it lodged flat, continuing to grow, the ends turned up about a foot, and went to seed. In August a platform reaper was put into this field and the height adjusted so as to take off the seed and as little of the stalk as possible, leaving the mass of clover straw upon the ground just as it grew, to be immediately plowed for wheat. While cutting, the platform of the reaper was allowed to fill and was then raked off at the same place, so that when the field was cut it presented a series of windrows across the field. When sufficiently dry, which was the next day, wagons were driven along the rows and the seed pitched on, a bunch at a time. In this way it was handled very rapidly. From this 10.078 acres there were threshed 48 50-60 bushels, or 4 5-6 bushels per acre.

WM. STRONG.

The above statement was accompanied by the necessary affidavits, and the premium was awarded to Mr. Strong for the best acre of clover seed.

STATEMENT OF YIELD OF ONE ACRE OF CORN.

To the officers of the Kalamazoo County Agricultural Society:

This is to certify that I harvested 75 bushels of shelled corn from the acre of corn entered for competition for premiums offered by the society at their annual fair of 1878.

The soil was a deep prairie loam; corn raised upon the same last year; no manure was used this season; the land was plowed May 8th and fitted in the ordinary way; planted May 10th to yellow Dent in hills four feet each way; cultivated three times, twice in a row each way, and hoed once; was husked from the hill about the middle of October, 1878.

ALBERT LITTLE.

The premium for best acre of corn was awarded to Mr. Albert Little.

After disposing of the above reports, on motion the Society proceeded to the election of President, Messrs. A. Cameron and E. R. Miller, acting as tellers. The result of the informal ballot was, W. H. Cobb 36, scattering 5. On motion of Mr. Neasmith, Mr. Cobb was declared unanimously elected. Mr. Cobb hoped the convention would elect some other person, as he did not wish the office. He was, however, voted in without a dissenting voice.

The Convention then proceeded to the election of Secretary, with the following result: Frank Little 34, Malachi Cox 1, H. E. Hoyt 7, Wm. Strong 3. Mr. Little was declared elected. Mr. Little hoped that he might be excused, but there was not one willing to excuse him, and he was declared unanimously elected.

Mr. McCourtie was re-elected Treasurer. The informal vote stood: McCourtie 34, C. E. Morrison 4, W. G. Pattison 1, J. B. Cobb 1, Wm. Bair 1, E. R. Miller 2. Mr. McCourtie was then declared unanimously elected.

The committee, Messrs. Little, Curtis and Bair, appointed to nominate an Executive Committee, retired and after a brief session, presented the following names: J. N. Stearns, of Kalamazoo, George Knappen, of Richland, Jarvis D. Adams, of Climax, Norton Pomeroy, of Kalamazoo.

Judge Wells spoke in favor of Franklin Wells, of Constantine. Whereupon, on motion, the Society voted to recommend said Franklin Wells to the Governor for re-appointment as a member of the State Board of Agriculture.

Remarks were made by Messrs. Cameron, J. D. Adams, William H. Cobb, Judge H. G. Wells, Little and others in favor of purchasing grounds for the Society. The necessity was shown to be immediate. Quite a large number signed the petition to the legislature for authority for the county to vote $15,000 for that purpose.

FRANK LITTLE,
Secretary Kalamazoo County Agricultural Society.

Kalamazoo, January 11, 1879.

KENT COUNTY.

The twenty-seventh annual fair of the Kent County Agricultural Society was held on the grounds of the society, adjacent to the city of Grand Rapids, on the 24th, 25th, 26th, 27th and 28th days of September, A. D. 1878.

On Wednesday, the second day of the fair, a violent thunder storm occurred which lasted the greater part of the afternoon. The storm was very severe and literally saturated everything that was not fully protected.

We expected a very large attendance on Wednesday afternoon, as the weather had previously been very pleasant, and the civic and military societies of Grand Rapids had arranged to parade on the fair grounds in the afternoon of that day.

In consequence of the storm our receipts on Wednesday were very light.

On Thursday we had a very large attendnnce, and as there was no malt or spirituous liquors sold on the grounds, and no gambling of any description allowed, every thing passed off to the entire satisfaction of the vast assemblage.

The total number of entries for premiums offered by the Agricultural Society was 1,335. The number of entries for special premiums, offered by the merchants and business men of the city of Grand Rapids, was 76 (this number does not include entries for sack and foot races, etc.)

The number of entries in the horticultural department, which was under the supervision of the Grand River Valley Horticultural Society, was 989, making a total of 2,400 entries.

As will be seen above, there is in this county an organized society known as the Grand River Horticultural Society, which has done a vast amount for the development of horticulture in this and adjacent counties.

The display of fruits and flowers in Pomological Hall was very fine, and attracted a great deal of attention during the fair.

The agricultural and horticultural societies have held joint or union fairs

since the organization of the latter, and in order to enable the horticultural society to make an attractive premium list, the agricultural society this year voted the sum of $500, which was paid in premiums for fruits and flowers.

The display in each department was remarkably fine, and compared favorably with former exhibitions. Farmers, merchants and mechanics were profuse in the exhibition of their various articles of merchandise, and a general feeling of satisfaction was manifested regarding the awards of the various viewing committees.

The election of officers took place at the fair grounds on Thursday, September 26, with the following result:

President—Levi Averill.
Secretary—James Cox.
Treasurer—Frank W. Foster.
Members of Executive Committee—John H. Withey, Henry Fralick, John Porter, Ed. B. Dikeman, Isaac B. Malcolm.

All of which is respectfully submitted.

JAMES COX, *Secretary.*

GRAND RAPIDS, Dec. 16, 1878.

MUSKEGON COUNTY.

Muskegon would respectfully make her first bow in this department by a report of her agricultural prospects and her society and fair.

LOCATION.

Muskegon county is located upon the east shore of Lake Michigan, between the counties of Ottawa and Oceana, and from Spring Lake and the Grand River Valley south it extends northward on the lake shore to the Clay Banks and Flower Creek, and inland or eastward it extends from eighteen miles at the narrowest to twenty-eight miles at the widest point. Muskegon, White and Black lakes, each opening into Lake Michigan, extend about six miles into the county and lie wholly within the county, while Spring Lake forms two miles or more of the southern boundary. These lakes are all navigable by even the largest vessels and give the county over seventy miles of lake coast, upon which are at least ten good ports and landings for the shipment of produce.

Into these lakes flow Muskegon, White and Black rivers, each used largely in lumbering. Four hundred millions feet of pine logs are annually rafted at the mouth of the Muskegon alone and 100,000,000 more on the other rivers and smaller streams not tributary to the Muskegon Thirty or more small streams tributary to those named and the lakes, pass across portions of the county in a southwesterly course. Bear Lake and Little Black Lake and about thirty smaller inland lakes, with the above named streams furnish an abundant supply of water for stock, add to the fertility of the soil, are a protection from early and late frosts, and yield an abundance of excellent fish.

SOIL

Every variety of soil may be found in the county. Large tracts of flat meadow land not yet utilized may be found—which will make the best of dairy

farms when brought under tillage; high and dry sandy plains are common, and which are our best strawberry fields, vineyards and peach orchards; clay bluffs and a few wet marshes and swales are also found. Some very heavy clay sections exist, where good wheat and other grains are grown. There are also many sections of intermingling areas of clay and sandy loam, with small sand knolls. Some beds of marl and of peat are found.

THE TIMBER.

This is largely pine, but there are sections of fine beech and hemlock, others of soft maple and ash, others of oak and some hard maple and elm—but save in some favored localities the forest has beem mostly cut for lumber or burned by the fires. Enough, however, is left for wood for many years to come.

PRODUCTS.

The county is yet comparatively new, but is rapidly developing. Thousands of acres invite the earnest farmer and intelligent fruit-grower to good investment and well-rewarded labor.

The strawberry is at home here; over 400 acres are now planted within five miles of this city; one hundred and seventy-one bushels of strawberries have been grown per acre, while perhaps fifty bushels is an average crop; and one hundred acres of flourishing vineyards are now growing, and others are being planted.

On our elevations peaches are a sure crop; thousands of trees are growing, and many thousands are to be planted the coming year. The plum is also a good crop, as are pears and cherries. The apple orchards are yet young, but promise well. Large plantations of the finer raspberries and blackberries are being made, while cranberry culture would be a paying investment to those who have suitable lands. Our crops of wheat, rye, oats and corn, generally good, were better than usual this year, and each year will add to the amount of acres sown to these cereals. Root crops, as potatoes and turnips, succeed remarkably here.

MARKETS.

Our advantages as to sale of products are excellent; Muskegon city with its 12,000 inhabitants, its lumber trade, requiring thirty thirty saw mills and shingle mills, and an annual port entry of 2,300 vessels, besides its other manufacturing interests will always make a good home market. Whitehall and Montague, with 5,000 inhabitants and similar interests make also a large home consumption.

The surplus, great or small, is easily shipped from the ten or more lake ports or from the sixteen railroad stations upon the four railroads passing through the county, and portions of it to the great markets west for fruit, and east for other products.

STOCK.

The stock of the country is yet small in amount; two or three herds of Shorthorns have been begun; a few flocks of good sheep commenced, while some excellent horses have been recently brought in, and the better breeds of hogs and poultry are appearing in creditable numbers.

Our farmers are all awakening to the need of better stock, especially sheep, and will soon, we hope, largely add to this industry. The dairy stock too, needs to be improved and increased to supply the home market for milk and butter.

FAIRS.

The first agricultural organization attempted was in May, 1875, when a stock company, known as the Muskegon County Agricultural and Driving Park Association, was formed with a capital stock of $10,000. The object of the association, as set forth in the articles of incorporation, was to promote agricultural, horticultural, pomological and mechanical arts and to improve the breeding and development of the American horse and other useful domestic animals.

A considerable stock was taken, enough to secure suitable grounds, upon which an excellent half-mile track was constructed with grand stand and sheds, and the whole suitably inclosed.

Two other horse fairs have been held with varying success, but no general fair was attempted until the fall of 1878. In the spring of this year the management of the association was placed in the hands of Charles Culver, a large farmer, as the president, who had associated with him C. L. Whitney as general superintendent, S. H. Stevens, secretary, and F. Albets, treasurer, with such division superintendents as seemed to be needed.

Under the direction of the president and general superintendent a large and well executed premium list was issued, offering $2,355 in premiums, to compete for which the counties of Oceana, Newaygo, Kent and Ottawa were invited to join with Muskegon at a fair on the 10th to 13th of September, at Muskegon.

The "Western Union Fair" was first announced to the public by a small circular on the first day of August, with only six weeks for preparation.

A large force of men was at once put at work upon the grounds erecting the necessary buildings and preparing for the fair. Lumber and other material was soon collected and four exhibition halls, each 60x22 feet, were put up with good frames and well shingled roofs, well sided with rough lumber, upon which will be put dressed siding another year and painted. The halls are so built that they can be easily lighted and extended to any length to meet the needs of the future exhibitions, and an art hall 100x40 feet is contemplated, to be placed at the head of the avenue passing all the others.

A suitable building for secretary's, president's and superintendent's offices was erected; also a ladies' cottage and a large number of cattle stalls and pens for hogs and sheep. The permanent buildings cost the society about $1,000, the material being mostly donated.

The grounds comprise over thirty acres. One the west side is the track, every foot of which can be seen by every one of the four hundred or more persons seated on the grand stand. On the eastern portion of the grounds is a beautiful second-growth oak grove of ten acres containing many large trees, amongst which are located the exhibition buildings, while along the east and north side are the sheds and stalls for stock. Good wells and a spring of purest water give an abundance of this needed article.

These grounds are situated about one and a-half miles southwest of the city proper, but are easily reached by good wagon roads with cheap busses—also by the Lake Shore railroad, which runs trains every two hours two and from the grounds to the several prominent streets of the city; and also by small steamers from all parts of Muskegon Lake.

THE EXHIBITION.

Although the time of the fair was early, right in seeding, and but little

advertised, yet it was, all things considered, a success, and laid the foundation of more successful ones in the future. One hundred and eight exhibitors made over 900 entries, which drew $868 in premiums. The contingent expenses of the fair were $336.81 and the total receipts of the fair $1,287.02.

The value of the property of the association is about $10,000, on which there is an indebtedness of about $1,200.

REMARKS.

The fair was a new thing to many of our citizens and farmers, and they were quite backward in preparation and attendance. The show of stock was slight, but in fruits of all kinds, vegetables and grain and flowers and plants was made a good display. Fine arts and needlework, pastry and dairy products were well represented, doing credit to our women. A good show of horses upon the track interested many by their speeding qualities. One excellent feature of the fair was the annual address by a fellow citizen, Hon. Levi Beardsley, which we think worthy of reprint, at least portions of it which we append:

C. L. WHITNEY, *General Supt.*

ADDRESS OF LEVI BEARDSLEY, ESQ.

MR. PRESIDENT AND FELLOW-CITIZENS,—Had a prophecy been made twenty-five years ago, that in the autumn of 1878, an agricultural gathering of this character would be witnessed in the county of Muskegon, those who cared to listen would have received it as a mere vagary of an irresponsible prophet, not only unworthy of honor in his own country but, likewise, unworthy of attention *anywhere*.

At that time the entire county was little more or less than a waste and wilderness. The aborigines had so suffered from the blight and decay which ever strike that peculiar people contemporaneously which civilization, as to make their appearance in this locality, even at that comparatively late period, excepting in small numbers, as rare, as would be their appearance in paint and wampum, on the thoroughfares of our most populous cities. But American enterprise never slumbers, and as oak after oak came crashing down at the magical touch of the ax, the roar of the falling monarchs was but a prelude to the mighty anthem which now makes the air vocal as twenty thousand people ply their vocations around us, changing shade into sunlight; making barren fields rejoice and by ponderous sinews of machinery converting earth's products from crude and pristine conditions into staples which gravitate toward ready markets as naturally and easily as luxurious fruit gravitates to the bosom of earth when an eager wind snaps the stem that held it to the parent stalk. Those of us who are discontented with the present and believe or *think* that we believe all matters and things to be awry; that enterprise has been hopelessly paralyzed and progress sternly halted in its onward path by some grim sentinel placed there by untoward events which will hold the fort until we are made captive, should candidly consider the condition of our county and State *now*, as compared with each preceding year of their respective histories. We should consider this condition comprehensively; as a whole; an aggregate, and not to bewail local, individual or insignificant difficulties which, for the time being, chill great expectations. Viewing the situation *thus*, and carefully noting the currents of events, we cannot conclude otherwise than that there is a steady drift toward prosperity, notwithstanding the dead weights riveted to our energies either through carelessness or design, by those who

should push on, rather than obstruct the majestic march of state and nation to glory. We cannot fail discovering, even in these darksome days, that there is not only a healthy growth in population but also, a healthy development of resources.

Let those birds of ill-omen who constantly croak "nevermore," as regards future success, plume their flight on the line of any or all of the roads that lead to and from this city, for instance, and they must discover evidences of improvement and growth. Slight though such evidences be, they effectually dispel the theory of retrogression. As it is contrary to the genius of the people as well as the republic, to stand still, we must either advance or go sideways, for we never retrograde, and I need not endeavor to impress upon the minds of this assemblage the well known fact that one of the peculiarities of this government and its people is that if a move is made at all the movement is invariable forward. Let us, therefore, though temporarily "under a cloud" as to business projects and prospects, have faith in the recuperative forces of the people, as well as in the stability of the government. If we add to our faith *works,* there can be little doubt but that the cloud will, in good time, pass away, giving place for the sun to burnish and bathe high and humble spots alike, as with a golden flood; bearing a blessing of God in each scintillation; calling into life, by its light and warmth and revivifying influences, the most latent powers of the nation and throwing a glorified pathway through the vista of the future wherein the people shall walk with peace and with thanksgiving to the great dispenser of good, who paints the violet with a touch of His finger and holds the earth as it goes thundering through the spheres, yet knows our infirmities and marks the fall of a sparrow. From the time of Adam to this hour man has been required to labor. Labor is an essential to the scheme of the creation and destiny of the world. It is just as necessary as an element in the consummation of that scheme as the law of attraction is necessary in holding the universe together. Without the labor of mankind all of the plans of creation would be frustrated. In short, it is a part of creation. There can be no excellence without it. It is to the world as harp-strings are to the harp; destroy either, and all harmony, time and tune are gone forever. It dignifies mankind; it ennobles the human race; it glorifies Jehovah! We of this country have been blest, indeed, compared, at least, with many other countries, in that our labor has generally met with commensurate returns. Such returns can be made more certain, first, by educating all classes of society to fully appreciate the true importance of labor in developing and working out the higher aims of creation and foreordinations of Divinity; and, second, by teaching certain classes that it is a duty as sacred as prayer to see that labor receives proper compensation, and that it is far easier and safer to undertake to haul down a nation's flag than to attempt to lower the standard of labor or degrade those who toil.

Well directed labor, in the ordinary vocations of life, goes much further and produces better results than herculanean efforts without (so to speak) proper objective points. In other words, though we toil untiringly, except our efforts are well and wisely directed we can expect but slight returns.

The three great secular pursuits with enlightened nations are agriculture, manufactures, and commerce. Each is subservient to the others. As vigorous life cannot be obtained without full and free action of the several organs and forces of the body, so our condition as a nation cannot be vigorous or healthy without the full and free action of these pursuits. Agriculture is creative: it

is as food to the body, while manufacture is the process by which the creative may be changed into more desirable or necessary conditions, as the digestive organs change food into blood, bone and muscle, while commerce sends the products through the channels of trade to enrich and sustain the masses, as the heart sends the life current through arteries and veins, imparting health and strength to the entire system.

Agriculture is the great power of the government, the Corinthian pillar that upholds the fabric—and to advance its interests and influence should be the desire of every man who has the love of country at heart. Such, I believe, is the desire of the society under whose auspices this assemblage has been called together; such will be its desire during succeeding years.

There is no question as to the adaptability of sandy soil for fruit growing. Our peaches, plums, apricots, crab-apples, etc., etc., will compare favorably with fruit of these kinds raised in any part or the State. It seems to me that enterprising capitalists could wisely invest in the business of canning fruits and vegetables on a large scale, in or near the city of Muskegon. An establishment of that kind would give employment to a goodly number of people, and call under care and culture a great deal of the land about us, which public opinion pronounces as almost worthles. There seems to be a necessity for our people to commence turning their attention to something beside lumber, against the time, not distant, when the pineries shall cease to yield their rich harvests. We cannot reasonably expect, judging from the wild butchery made upon the forests for the past few years, they will continue available much longer.

To forestall the possible disasters which will otherwise follow the leveling of the once mighty forests of the north, is one of the prime objects of this agricultural society, and, for one, I am hopeful in the belief that the dangers will be averted if all who are interested in the future of this part of the State will encourage efforts made and to *be* made by this society. I cannot imagine that with an organization of this character, and with such determined and energetic men at its head as this organization has, Muskegon need dread the coming years though every pine be swept from earth, and every mill on our beautiful lake may fall piecemeal upon its fair bosom. Sad, indeed, will be the day when the gang and circular shall cease their motion; when the cheery sparks that now fleck the night with fire shall fade; when the hearty sounds of good natured, though grumbling old whistles shall die in echoes, and crashing, roaring, shrieking, whirring machinery shall gather rust in silence and solitude. But the cheering promise as contained in holy writ, lights up the dreary scene as memory lights the pictures that hang in the halls of the past. "The earth shall yield her increase," comes welling up from ages buried in forgetfulness, carrying in the assurance a hope akin to that which plumed its wing when: "Let there be light," reverberated through the corridors of heaven, and a new born sun chased the spirits of chaotic darkness away from infant earth as she lay cradled in a hand of the Almighty. We are, I will assume, free moral agents, and can, therefore, do as we please. If we choose to help ourselves who can doubt that Providence is ready and willing to help us! The days of miracles are past —we cannot command this fig tree to bear fruit, or that one to bear no fruit, with any reasonable expectation that either tree will "care a fig" what we command; but we can use all means given us, and they are many, to improve, cultivate and build up. If the support and countenance of the people at large are turned from associations devoted to the interests of agriculture, and called into existence by the exigencies of the times, we may as well get ready to tod-

dle out of here when the last raft comes down. But with concert of action and a hearty support from all, the welfare of the masses may be secured through the influence of such associations, and our children's children may be permitted to sit beneath their own vines beside the lake whose shimmer we see in the distance, with none to molest or make them afraid. Immediate, constant and steady efforts is required to bring about the hoped for results. This fair is the beginning of splendid efforts to be hereafter crowned with splendid results.

Manufactories by proper action can be established in our midst. Capital from abroad will seek this point, possessing as it does so many facilities for success, provided capitalists become satisfied that the masses here are not oblivious to their own and their children's happiness. "Prompt action," should become the rallying cry of the people. When the wealth of the nation, so long locked in paper vaults by golden keys shall be released and turned again into the legitimate channels of business—opening all of the old avenues where prosperity used to move; bending on canvas to spars nearly dozed with age; lighting fires in blast-furnaces and rolling-mills which have known no warmth for years; cause wheels and spindles in factories to fairly laugh with excessive motion; provoking the very mountains to groan as the rich ore is torn from their bosoms; when cheeks made hollow by long fasting shall again wear the rose of health; when strong men whose only crime is poverty, shall desert the grand army of tramps for the forge and workshop; when those whose hands are now weak for lack of food, but whose hearts are strong in bitterness of grief, at seeing loved and helpless ones suffer, shall again join the anvil chorus; construct mighty locomotives and launch palatial steamers; in short, when follies and fallacies shall be swept away, as insects are said to have been swept by the winds of enraged Jove, and the people shall have confidence in each other and fraternal feeling shall take the place of corroding jealousies and hatred, *capital* may be drawn to our home if capitalists are led to believe that we desire to help ourselves.

In what better way can we begin to help ourselves than by lending aid and encouragement to our agricultural society? And how can the society be more encouraged than by having the people take its remaining stock, thereby becoming a part of the society and co-workers in its interests?

The organization feels encouraged and thankful by and for the help it *has* received, but much more can and should be done to help and strengthen it.

Go on, then, in the course began, gentlemen of the Agricultural Association, taking heart for future work from the success attained in this, your first great effort; and when your noble task is accomplished, as far as you can aid in its accomplishment, be sure that a grateful posterity will hold your names in happy remembrance.

Many of us are passing swiftly to the close of life, and soon, "The night cometh wherein no man can work." If in the remaining time allotted us, practical good can be secured for those who follow, by any course of action on our part, the afternoon of our existence will not have been misspent; and when the sunset comes and we sink beneath the purple clouds, the consciousness will be ours of having been "faithful in a few things" and our last glance may fall on a path of splendor left behind, wherein loved ones of life shall be seen, in attitudes of benediction, gazing with a calm hope toward the spot where our light has faded forever.

MUSKEGON AND OCEANA COUNTIES.

In accordance with usage and our constitution, I herewith present our report for the year 1878. In tracing the history of the past year we find much to encourage us as a society to future efforts, and much by which we can profit. Our Agricultural Society held its first fair at Whitehall, October 1st to 4th inclusive. The exhibition in nearly all respects was a success, especially for a new county, and the first fair for the society. Fine horses, fine cattle, fine fruits, a good display of things useful and ornamental, and a large attendance is the general summing up for the year. The entries were nearly two hundred in number, and the receipts amounted to $451.15. Expenses, including premiums paid $240.14. The society numbers 162 member, but as yet have no grounds of their own. In addition to this sum they have about $82 worth of lumber snugly piled for erection of buildings another season.

The officers elected for 1879 are President, A. Mears; Secretary, C. P. Nearpass; Treasurer, E. M. Ruggles.

Our society is known as the White Lake Agricultural and Industrial Society, and embraces the northern portion of Muskegon and southern portion of Oceana counties. We are in what is termed the famous fruit belt, which is well known to be favorable to peaches. Already considerable attention is being given to the cultivation of peaches, grapes and small fruits, which grow and thrive to perfection. It is a well known fact that Lake Michigan exerts an influence on the adjacent country which is worthy of more careful investigation by horticulturists than is now known or realized by the majority of fruit growers. The spring finds Lake Michigan a mass of water nearly covered with floating ice. The effect of this floating ice is to retard the season and prevent the early season and prevent the early expansion of buds, and not until summer weather is fairly established and danger of frosts over, does the water of Lake Michigan become warm so as to melt the ice and permit the expansion of the fruit buds. As the season advances the water of the lake warms by the influence of the sun's rays, and is much less changeable in its temperature than the land breezes. It warms slowly, but when warmed, it retains the heat proportionately with its depth and volume. The effect of this warm condition of the lake water is to prevent sudden changes in the atmosphere. In the forenoon the breeze is usually towards the lake, and in the afternoon a lake breeze comes over the land, modifying the temperature and making the hottest days of July and August pleasant and agreeable, while in the fall it prolongs summer beyond the period of killing frosts. Its breezes constantly temper the winds, it remaining substantially open during the entire winter, making a difference during every cold period of from ten to twenty degrees in our favor.

The soil is greatly diversified, some portions being rich alluvial, with clay subsoil, others loam, light sand and again heavy clay. The timber is of all qualities, pine, hemlock, oak, beech, maple, basswood, elm, black cherry, etc., etc. An erroneous idea is entertained by many concerning the character of the soil on which the pine is found. Many have the impression that nothing can be raised on this light sand, but even where pine is almost the only timber upon the ground, it has been found that the soil is capable of producing excellent returns to the agriculturist. Our wheat is of the best quality, our peaches bring the highest price in the market, and our potatoes often command an advance of ten cents in the Chicago and Wisconsin markets.

Feeling that I have already taken up too much space, I respectfully submit the foregoing.

C. P. NEARPASS, *Sec'y.*

SAGINAW COUNTY FARMERS' CLUB.

In July, 1878, a farmers' institute was held in this county at which the attendance was large and the interest manifested was great. One of the results of that institute was the organizing of the Saginaw County Farmers' Club, on the 23d of February following, with a membership of 23. A committee was appointed to draft a constitution and by-laws, and a meeting held on March 9th and the club fully organized, with Chas. D. Little for president, E. F. Guile secretary, and R. W. Beeman treasurer. An executive committee of 12 were elected from the members, of which three with the president and secretary form a quorum for the transaction of business. Meetings have been held each month since the organization alternately in Saginaw City and East Saginaw, at which essays have been read and discussions followed. From these, together with the interchange of opinions and experiences, much practical information has been brought out and most of it made a matter of record by the secretary. The attendance of the members has been fair to good and the interest seems to be increasing and is much better than was expected in the beginning. Reports of crops are brought in each month and made a matter of record, but only recently has this been done. Wheat and grass are reported in good condition at present, with a good body of snow to protect it and no frost in the ground. Dr. I. N. Smith, of Saginaw City, read an essay in March on "Michigan as an agricultural state as compared with the best farming states in the union," which was published in all the local papers and has been copied largely by the press throughout our state. He selected the year 1875 for comparison and gave the quantity per acre with the value singly and per acre on all the products of the farm in seven of the best agricultural states, besides our own. With the exception of California, Michigan leads in money value per acre in nearly all the products of the farm, and in quantity per acre she holds her own well.

In April David Geddes read an essay on "Spring crops," and putting them in in which he gave his experience as a practical and intelligent farmer, being one of the best in the county. The month of May called forth from John Fischer a very excellent essay on "The best manner of cultivating spring crops." The discussion of this subject was quite animated, and much practical information was presented to the club. June with its roses and blossoms called forth from the President, C. D. Little, "The best time and manner of harvesting summer crops." The secretary being absent no record was made of this paper or discussion. Dennis Bow, of Bridgeport, read an essay in July on "Preparing the ground for wheat and for spring crops," whether or not it was best to plow in the fall or spring, in which he advocates fall plowing on clay or all heavy soils, and spring cultivation on all light, sandy or gravelly soils. Discussion followed on seeding with clover and grass, also manner of plowing, tools to be used, etc., the general tenor of which was that money was thrown away in getting poor tools and slighting the work. Much better results are

obtained, and the more thoroughly the ground is pulverized the better the crops. In August S. W. Beeman read an essay on "Harvesting Fall Crops," which elicited considerable discussion upon time, manner and tools for harvesting, in which much practical information was advanced. Geo. P. Butler read an essay on "Keeping vegetables," and L. C. Whiting on "Bees and honey," in September, during the progress of the county fair. Dr. Plessner entertained the club with an essay on "Fruit for winter use" at the October meeting, showing scientifically the benefit derived from the use of fruit, and the manner and causes of decay, also best modes of keeping. The month of November brought out James Graham with an essay on "Wintering Stock," which was interesting and some discussion followed. Mr. John C. Spaeth told us all about manure and winter work in December, and in January the secretary and Dr. I. N. Smith gave a little talk on orchards and fruit, with a number of fine specimens for examination. Mr. Robert Ure enlightened us all about cattle in February, which was valuable, and the secretary read a letter from Judge Birney on cattle in Holland. Much interest has been manifested, and the attendance fair, but both are increasing as the objects and aims of the club become better known. Reports of crops each month are reported from different parts of the county by the numbers, of which a record is made.

That a farmers' club should be organized and successfully run away up in Northern Michigan among the pineries will doubtless be surprising to many in the older counties of the State. But if they will take the trouble to look on the map they will see that our county is south of the center line of the State, and according to the wheat map of the State published by the Agricultural College we are in the wheat belt, and we think those 254 bushels of Clawson wheat, full weight, raised from three and one-half acres of ground, would entitle us to the banner of wheat producing counties. Mr. David Geddes, President of the Agricultural Society, raised this amount, and from ten acres raised 1,840 bushels of ears of corn, or 920 bushels of shelled corn of the Hackbury Dent variety. The soil was clay loam, underdrained. The first year a good clover sod was turned under and planted to corn, from which he harvested the above crop. The next spring it was plowed and sowed to barley, from which he harvested thirty-six bushels per acre. The ground was plowed twice, manured, and sown to wheat and harvested as above.

It has been said of the Saginaw valley that it was fit only to breed frogs and ague, but experience has shown that we have some of the best agricultural lands in the state, and as people begin to learn these facts our lands begin to be cleared and made into good farms; but the progress has been very slow. Gratiot county on the west and Tuscola county on the east have made very rapid progress in agriculture. The lands in these counties, except where bordering on Saginaw county, are high, rolling, possessing natural facilities for drainage, both, atmospheric and soil, the former of which is as necessary as the latter. Some portions of the land in our county being very level and low, being traversed by Saginaw, Cass, Flint and Shiawassee rivers, soil drainage could not be readily effected except by combination, which is not easily done. When the state passed the drainage law it was thought it would be the means of settling our level lands, as they could be drained and the cost taxed pro rata; but we were doomed to disappointment, and now the last experiment comes in the way of dyking after the system adopted in Holland, which so far is a success and has not been very costly. This only relates to lands adjacent to the streams and especially along the Shiawassee and Saginaw rivers, along which

and adjacent to are large amounts of prairie and marsh lands which extend into Bay county, which are subject to overflow each season, but are mostly covered with blue-joint grass of very good quality, most of which is cut each year. The soil is heavy clay covered with muck varying in depth from three inches to several feet. The lands lying away from the streams are high, rolling, some places quite sandy, any of which with good cultivation will return to the tiller if not better than many of the older counties.

Manufactures have made rapid progress and we have a large capital invested, some of which now is seeking other investments, or rather the surplus, and farming is looked upon with much favor. When our lands have been worked intelligently, farming has been very profitable, but when parties have preferred quantity to quality the profits were liable to go on the wrong side of the ledger. As a means to promote better and more intelligent farming, and for this purpose the Saginaw County Farmers' Club was organized. It has held monthly meetings that information of a practical character, which might be beneficial both to those who are beginning and those who had some experience, might be disseminated.

Respectfully, E. F. GUILD, *Secretary.*

STOCKBRIDGE UNION AGRICULTURAL SOCIETY.

As the law directs that a report from every Agricultural Society shall be made each year, ours is as follows:

This society was organized December 8th, 1877, under the title of the Stockbridge Union Agricultural Society, composed of the townships of Stockbridge, Whiteoak, Bunker Hill, Iosco, Unadilla, Lyndon and Waterloo. The township of Ingham has since united with the society. We have rented twenty acres of land for twenty-five years or less, as we choose, at $100 per year.

Had on hand from previous temporary fair about $100, raised $100 by one dollar donations, received for rents during fair $115, for tickets $1,015, making a total of about $1,330, expended for lumber and fencing $300, expended for rent and expenses $200, expended for premiums $200, leaving on hand about $600.

W. M. STEPHENS, *President.*
S. P. REYNOLDS, *Secretary.*
JOHN FARMER, *Treasurer.*

Stockbridge, Ingham county, Mich., December 13, 1878.

REGISTER OF

METEOROLOGICAL OBSERVATIONS

FOR THE YEAR 1878,

TAKEN AT THE

State Agricultural College of Michigan,

BY R. C. KEDZIE,

PROFESSOR OF CHEMISTRY.

LATITUDE 42° 42′ 24″; LONGITUDE 7° 33′ 19″ WEST OF WASHINGTON.

Height above the Sea, 895 feet.

METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	31	32	29	30⅔	.155	.162	.160	89	89	100	28.963	28.890	28.912	28.922
2	18	19	9	15⅓	.098	.103	.065	100	100	100	29.123	29.182	29,259	29.188
3	11	25	20	18⅔	.071	.066	.108	100	49	100	29.267	29.013	28.990	29.090
4	22	28	15	21⅔	.118	.153	.086	100	100	100	28.839	28.863	28.980	28.901
5	9	12	2	7⅔	.065	.075	.048	100	100	100	29.196	29.055	29.015	29.087
6	3	15	5	7⅔	.050	.086	.055	100	100	100	29.138	29.189	29.356	29.228
7	8	15	9	10⅔	.062	.055	.051	100	64	77	29.511	29.513	29.454	29.493
8	12	19	24	18⅓	.060	.087	.111	80	84	86	29.286	29.215	29.237	29.246
9	26	34	36	32	.123	.155	.170	87	79	80	29.193	29.056	28.955	29.068
10	34	36	33	34⅓	.196	.191	.188	100	90	100	28.834	29.263	28.807	28.968
11	33	37	34	34⅔	.188	.178	.162	100	81	84	28.895	29.009	29.109	29.004
12	28	31	29	29⅓	.142	.155	.142	88	89	88	29,234	29.229	29.212	29.225
13	30	30	30	30	.148	.148	.167	89	89	100	29.118	28.990	28.894	29.001
14	31	36	32	33	.174	.149	.143	100	71	79	28.832	28.876	28.919	28.876
15	30	33	29	30⅔	.148	.168	.160	89	89	100	28.974	29.042	29.164	29.060
16	18	27	27	24	.098	.111	.147	100	75	100	29.257	29.219	29.150	29.209
17	25	36	33	31⅓	.100	.212	.168	74	100	89	29.021	28.987	29.103	29.033
18	33	43	31	35⅔	.168	.164	.168	89	59	95	29.219	29.176	29.176	29.190
19	33	47	35	38⅓	.168	.179	.162	89	55	80	29.151	29.086	29.034	29.090
20	38	41	35	38	.229	.241	.204	100	95	100	28.936	28.882	28.929	28.882
21	33	35	31	33	.188	.204	.174	100	100	100	28.950	28.925	28.894	28.893
22	31	32	15	26	.155	.162	.086	89	89	100	28.837	28.804	29.111	28.917
23	9	22	19	16⅔	.065	.084	.082	100	71	84	29.431	29.410	29.443	29.428
24	20	40	34	31⅓	.113	.139	.175	100	56	89	29.177	28.971	28.946	29.431
25	34	40	37	37	.175	.182	.199	89	73	90	29.056	28.950	28.950	28.986
26	34	34	32	33⅓	.175	.155	.143	89	79	79	29.061	29.035	29.145	29.080
27	30	32	30	30⅔	.148	.181	.142	89	100	84	28.927	28.824	28.906	28.886
28	11	19	11	14⅔	.082	.087	.071	100	84	100	29.137	29.177	29.237	29.183
29	6	27	17	16⅔	.057	.147	.094	100	100	100	29.343	29.351	29.393	29.362
30	16	29	24	23	.090	.160	.129	100	100	100	29.387	29.260	29.024	29.223
31	21	27	21	25	.129	.147	.129	100	100	100	28.959	28.929	28.907	28.972
Sums.	......	......	......	809⅓	......	......	......	......	......	......	......	......	......	......
Means	......	......	......	29°.11	.128	.144	.132	93	84	90	......	......	......	29.123
Average						.135			89					

THE MONTH OF JANUARY, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
100	Cu. St.	100	Cu. St.	100	Cu. St.	S W	8	W	1	S W	4	3	5	32	18	10 P.M.	----	----	----
100	Nim.	20	Cu.	00	--------	N	8	N	4	----	0	4	5	20	9	------	10 A.M.	.01	¼
00	--------	5	Cir. St.	90	Cir. St.	S W	1	S E	8	S E	2	4	5	25	12	Night.	----	----	----
100	Nim.	100	Nim.	50	St.	----	0	N	4	N	16	4	4	28	6	------	N't.	.11	2¼
100	St.	100	Nim.	00	--------	S W	1	S W	8	----	0	4	3	12	-4	2 P. M.	6 P. M.	.07	½
30	Cir. St.	100	Nim.	00	--------	----	0	N W	16	N W	4	4	5	18	-3	Snow Sq'lls.	----	.01	¼
100	St.	100	St.	100	St.	----	0	W	4	S W	4	5	6	15	8	------	----	----	----
100	Nim.	100	St.	100	St.	S W	8	S W	8	S W	4	6	6	26	12	------	----	----	----
100	St.	100	St.	100	St.	S	4	S	8	S	8	5	4	36	27	------	----	----	----
100	St.	100	St.	100	St.	S E	4	----	0	----	0	4	2	37	31	------	----	----	----
100	St.	90	Cir.	100	St.	N W	4	N W	8	N W	4	3	3	37	25	------	----	----	----
100	St.	100	St.	100	St.	S W	2	----	0	S E	4	3	5	31	28	------	----	----	----
100	St.	100	Nim.	100	Nim.	E	8	N E	8	N W	8	3	6	31	30	2 P. M.	10 P. M.	.20	2
100	Cu. St.	10	Cu.	100	Cir. St.	N	8	W	12	N W	12	4	4	36	29½	------	----	----	----
100	St.	100	Cu. St.	100	St.	S W	8	N W	8	N W	1	5	6	34	15	------	----	----	----
90	Cir.	100	Cu. St.	100	Cir. St.	----	0	S	4	----	0	5	4	27	19	------	----	----	----
00	--------	100	St.	100	Cu. St.	----	0	S W	2	----	0	3	4	36	25	------	----	----	----
80	Cir. St.	00	--------	00	--------	S E	4	S W	4	----	0	4	4	43	30	------	----	----	----
00	--------	10	Cir. St.	100	Cir. St.	----	0	S W	8	----	0	3	3	48	33	In Night.	----	----	----
100	Nim.	100	Nim.	100	Nim.	----	0	N	4	N	8	2	4	41	33	------	8 A.M.	.17	----
100	Nim.	100	St.	100	Cu. St.	N E	4	----	0	W	10	2	4	35	31	------	----	----	----
100	St.	100	Nim.	100	St.	W	4	W	2	N W	4	3	6	32	9	Snow Sq'lls.	----	.05	----
00	--------	00	--------	20	Cir.	N W	8	N W	2	S E	4	4	4	22	12	------	----	----	----
30	Cir. St.	100	St.	100	St.	S E	8	S	8	S W	4	3	3	40	20	------	----	----	----
60	Cir.	100	Cu. St.	100	Nim.	----	0	S W	4	S W	4	0	4	40	32	In Night.	----	.05	----
100	St.	100	St.	100	Cu. St.	W	8	W	8	S W	4	3	3	37	30	------	----	----	----
100	Cu. St.	100	Cir. St.	100	St.	E	4	N E	4	N	12	4	5	33	14	------	----	----	----
100	Cu. St.	10	Cu.	00	--------	N W	8	N W	4	----	0	4	4	20	5	Snow Sq'lls.	----	----	----
30	Cir. St.	10	Cir. St.	60	--------	----	0	S W	1	----	0	4	4	27	7	------	----	----	----
50	Cir. St.	100	Cir. St.	100	Nim.	----	0	N E	8	N E	4	5	6	29	16	In Night.	----	----	----
100	Nim.	100	Nim.	100	Nim.	N E	12	N E	12	N E	8	6	8	27	23	------	----	.45	8
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	1.12	13¼
76	--------	76	--------	76	--------	----	--	----	--	----	--	3.7	4.3	38°	18°.7	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	26	30½	27	27⅔	.141	.167	.147	100	100	100	28.964	29.007	29.159	29.043
2	18	30	17	21⅔	.098	.130	.094	100	78	100	29.353	29.375	29.403	29.343
3	-4	29	4	9⅔	.036	.160	.052	100	100	100	29.377	29.304	29.230	29.303
4	1	34	16	17	.046	.155	.090	100	79	100	29.160	29.067	29.041	29.089
5	17	39	31	29	.094	.173	.174	100	73	100	29.076	29.046	29.080	29.067
6	31	45	39	38⅓	.118	.160	.152	68	53	63	29.110	29.057	29.033	29.067
7	33	47	32	37⅓	.131	.156	.162	70	48	89	29.015	28.924	28.850	28.930
8	34	36	32	34	.155	.170	.181	79	80	100	28.739	28.666	28.714	28.707
9	24	23½	21	22⅔	.129	.123	.113	100	100	100	28.806	28.770	28.762	28.813
10	17	22	10	16⅓	.094	.118	.068	100	100	100	28.731	28.771	28.912	28.838
11	-1	29	16	14⅔	.042	.160	.090	100	100	100	29.085	29.066	29.036	29.062
12	22	32	29	27⅔	.118	.162	.160	100	89	100	28.883	28.728	28.945	28.845
13	24	32	20	25⅓	.129	.162	.108	100	89	100	29.034	29.021	29.053	29.036
14	17	34	23	24⅔	.094	.155	.123	100	79	100	29.024	28.973	29.017	29.071
15	15	33	26	24⅔	.086	.113	.123	100	60	87	29.032	29.037	29.071	19.047
16	23	33	33	29⅔	.123	.150	.188	100	80	100	29.087	29.020	29.027	29.045
17	33	32	27	30⅔	.188	.143	.129	100	79	88	28.965	29.061	29.174	29.067
18	8	31	14	17⅔	.062	.111	.082	100	67	100	29.256	29.317	29.285	29.286
19	15	34	33	27⅓	.086	.155	.168	100	79	89	29.128	28.975	28.860	28.921
20	36	52	37	41⅔	.191	.136	.221	90	35	100	28.769	28.838	28.863	28.840
21	37	41	38	38⅔	.221	.257	.229	100	100	100	28.815	28.682	28.556	28.684
22	37	37	34	36	.221	.221	.196	100	100	100	28.476	28.515	28.672	28.554
23	32	35	32	33	.181	.142	.125	100	70	69	28.807	28.897	29.003	28.869
24	30	35	30	31⅔	.148	.142	.148	89	70	89	29.074	29.064	29.116	29.065
25	24	32	26	27⅓	.129	.162	.141	100	89	100	29.172	29.222	29.349	29.248
26	22	43	28	31	.118	.121	.135	100	43	88	29.509	29.429	29.409	29.449
27	22	47	29	32⅔	.118	.133	.160	100	41	100	29.354	29.217	29.160	29.243
28	25	50	39	36	.117	.162	.152	87	45	63	29.143	29.223	29.243	29.203
29	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	--------
30	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	--------
31	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	--------
Sums.	------	------	------	786	------	------	------	------	------	------	--------	--------	--------	--------
Means	------	------	------	28°.07	.122	.153	.140	96	76	94	--------	--------	--------	29.029
Average ------------------						.138			89		------------------------------------			

THE MONTH OF FEBRUARY, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
100	Nim.	100	Nim.	100	Cu. St.	N W	1	N E	2	N E	1	8	7	31	14	------	7 P. M.	.90	8
00	--------	00	--------	00	--------	----	0	N E	--	----	0	6	4	30	-7	------	----	----	----
10	Cir. St.	00	--------	00	--------	----	0	----	0	----	0	4	3	29	-4	------	----	----	----
00	--------	00	--------	00	--------	----	0	S W	2	----	0	5	4	34	-1	------	----	----	----
10	St.	00	--------	100	Cir. St.	----	0	S W	4	S E	1	5	6	39	15	------	----	----	----
50	Cir. St.	5	Cir.	00	--------	S W	2	S W	5	S	2	4	4	46	28	------	----	----	----
30	Cir. St.	90	Cir. St.	00	--------	S	3	S W	4	----	0	3	6	49	29	------	----	----	----
100	Cir. St.	100	St.	100	Nim.	N E	2	N E	2	N E	1	4	7	37½	24	2:15 P. M.	----	----	----
100	Nim.	100	Nim.	100	Nim.	N	4	N E	8	N W	5	7	8	24	17	------	----	----	----
100	Nim.	60	Cir.	00	--------	N W	2	N	1	----	0	7	6	24	-2½	------	10 A. M.	.42	3
90	Cir.	100	Cu. St.	00	--------	----	0	W	4	S W	3	6	8	30	14	------	----	----	----
100	Nim.	100	Nim.	100	St.	S	1	S W	4	----	0	7	5	32	22	4 A. M.	3 P. M.	.25	2
100	Cu. St.	10	Cir. St.	00	--------	N W	5	N E	2	N E	2	4	6	35	12	------	----	----	----
50	Cir.	90	Cir.	00	--------	N E	3	N E	4	N E	1	4	4	35	14	------	----	----	----
20	Cir.	10	Cir.	100	Cir. Cu.	----	0	----	0	----	0	5	5	33½	16	------	----	----	----
100	St.	100	Nim.	100	St.	----	0	S W	4	S W	3	6	7	36	24	12:15 P. M.	----	.23	1
100	St.	100	Cu. St.	100	Cu. St.	----	0	N E	8	----	0	7	7	33	8	------	----	----	----
00	--------	10	Cu.	00	--------	----	0	N W	2	----	0	4	5	35	8	------	----	----	----
90	Cir.	100	Cu. St.	100	Nim.	S W	12	S	5	S E	8	7	8	36	15	4 P. M.	1 P. M.	.12	----
100	Cu. St.	30	St.	40	St.	----	0	S W	12	----	0	3	4	55	36	5 A. M.	----	----	----
100	Nim.	100	Nim.	100	Nim.	----	0	N E	2	----	0	3	3	41	37	------	----	----	----
100	Nim.	100	Nim.	100	St.	----	0	N W	5	N W	1	3	6	37	32	------	----	----	----
100	Nim.	100	Cu.	100	St.	W	9	W	6	N W	8	6	5	35	26	------	9 A. M.	1.22	¼
90	Cu.	100	Cu.	100	St.	W	10	N W	2	N W	1	5	7	37	24	------	----	----	----
100	Nim.	70	Cu.	00	--------	N W	3	N W	8	N W	2	7	5	33	20½	Snow Sq'lls.	----	.05	----
00	--------	00	--------	00	--------	----	0	W	2	----	0	4	3	43	22	------	----	----	----
00	--------	00	--------	00	--------	----	0	W	3	----	0	2	2	47	22	------	----	----	----
00	--------	30	Cir.	00	--------	----	0	W	7	N W	4	4	4	51	25	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	2.74	14¼
62	--------	57	--------	48	--------	----	--	----	--	----	--	5	5⅓	38°	17°.5	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, In Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	29	48	35	37⅓	.160	.189	.183	100	56	90	29.397	29.349	29.189	29.311
2	39	46	47	40⅔	.238	.238	.298	100	77	92	28.829	28.590	28.982	28.808
3	35	35	32	34	.204	.183	.181	100	90	100	28.457	28.560	28.729	28.595
4	27	35	28	30	.111	.142	.123	75	70	77	28.964	29.004	29.059	29.009
5	31	54	46	43⅔	.155	.157	.192	59	38	62	29.062	28.912	28.917	28.963
6	39	57	48	48	.238	.466	.335	100	100	100	28.970	28.890	28.846	28.902
7	42	59	39	46⅔	.267	.269	.238	100	54	100	29.000	29.062	29.150	29.070
8	44	61	56	51⅔	.241	.257	.391	84	43	87	29.232	29.189	29.328	29.249
9	51	72	55	59⅓	.196	.320	.321	52	40	74	29.282	29.218	29.205	29.235
10	51	65	51	56⅔	.289	.359	.418	76	58	100	29.140	28.969	28.967	29.025
11	43	63	46	50⅔	.278	.216	.262	100	37	84	29.072	29.062	29.075	29.069
12	43	43	37	41	.271	.278	.221	96	100	100	29.056	28.919	28.818	28.931
13	37	44	41	40⅔	.221	.241	.257	100	84	100	28.826	28.855	28.890	28.857
14	36	42	41	39⅔	.212	.199	.235	100	74	91	28.961	29.067	29.168	29.065
15	32	55	42	43	.181	.218	.199	100	50	74	29.250	29.182	29.093	29.175
16	44	47	39	40	.241	.225	.238	84	70	100	28.857	28.831	28.885	28.857
17	40	39	37	38⅔	.248	.227	.221	100	95	100	28.896	29.099	29.215	29.070
18	35	42	38	38⅓	.204	.199	.186	100	74	81	29.282	29.249	29.192	29.241
19	38	52	42	44	.208	.257	.199	91	66	74	29.140	29.103	29.172	29.138
20	32	51	34	39	.162	.173	.175	89	46	89	29.353	29.204	29.238	29.361
21	34	44	35	36⅔	.165	.199	.183	84	71	90	29.203	29.162	29.224	29.196
22	33	52	40	41⅔	.188	.232	.203	100	60	82	29.276	29.212	29.123	29.203
23	46	62	43	50⅓	.238	.312	.278	77	56	100	28.870	28.713	28.614	28.742
24	22	23	19	21⅓	.084	.089	.087	71	72	84	28.821	28.874	28.966	28.887
25	24	33	28	28⅓	.129	.188	.153	100	100	100	29.040	28.999	29.032	29.023
26	32	36	35	34⅓	.181	.170	.162	100	80	80	29.005	28.840	28.684	28.846
27	53	49	39	47	.296	.272	.238	79	78	100	29.200	28.719	28.716	28.878
28	31	38	30	33	.174	.186	.148	100	81	89	28.767	28.901	29.136	28.934
29	28	48	37	37⅔	.135	.143	.178	88	43	81	29.229	29.309	29.269	29.299
30	35	33	34	34	.204	.188	.196	100	100	100	29.161	28.880	28.815	28.952
31	37	38	38	37⅔	.221	.229	.223	100	100	95	28.856	28.933	29.029	28.939
Sums	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Means	------	------	------	40°.90	.204	.228	.223	90	70	88	------	------	------	29.027
Average						.219			83					

THE MONTH OF MARCH, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
50	St.	25	Cir.	100	St.	E	1	S	2	E	2	4	5	48	29	------	----	----	----
100	Nim.	70	Cu. St.	100	Nim.	S E	5	S E	7	S E	7	4	5	53	35	5 A. M.	7 P. M.	.50	----
100	Nim.	100	Cu. St.	100	Cu. St.	N	7	N W	10	N W	15	5	7	35	26	------	----	----	----
100	St.	40	Cir. Cu.	00	--------	N W	10	N W	11	N W	2	4	6	36	27	------	----	----	----
90	Cir. St.	80	Cir.	30	Cir.	S W	6	S W	16	S	11	6	4	54	31	------	----	----	----
90	Cir.	100	Nim.	90	Cir. St.	----	0	S W	7	S W	8	5	7	58	39	2 P. M.	8 P. M.	.29	----
00	--------	30	Cu.	00	--------	S W	4	S W	5	----	0	4	4	59	35	------	----	----	----
90	Cir.	90	Cir. St.	100	Cir. St.	S E	4	S E	9	S E	7	5	4	64	41	------	----	----	----
80	Cir.	00	--------	60	--------	S E	3	S E	9	S E	3	4	4	72	51	------	----	----	----
100	Cir. St.	100	Cir. St.	100	Nim.	S E	5	S E	6	S	2	4	5	67	43	6 P. M.	N't.	.20	----
00	--------	90	Cir. St.	00	--------	----	0	W	4	----	0	5	4	65	43	------	----	----	----
100	St.	100	Nim.	100	St.	N E	5	N	8	N	8	6	7	45	36	---- -	----	----	----
100	Nim.	100	Cu. St.	100	Nim.	N	5	N W	3	----	0	5	5	44	36	8 P. M.	----	----	----
100	St.	100	Cu. St.	100	Cu. St.	----	0	----	0	----	0	3	1	44	29	------	5 P. M.	.31	----
00	--------	5	Cu.	10	Cir.	----	0	S W	3	S W	2	2	8	55	32	Night.	----	----	----
100	Cu.	100	Cu.	100	Nim.	S W	2	W	2	W	4	4	5	48	37	------	----	----	----
100	Nim.	100	Nim.	100	Nim.	N W	4	N	8	N	2	7	3	41	35	------	9 P. M.	.32	----
100	St.	100	Cu. St.	100	St.	----	0	W	1	N W	6	5	6	45	36	------	----	----	----
100	Cir.	30	Cu.	00	--------	S W	4	S W	9	W	7	4	3	52	28	------	----	----	----
20	Cir. St.	40	Cu.	00	--------	N	5	S W	5	----	0	3	4	52	31	------	----	----	----
100	St.	100	Cu. St.	50	Cir. St.	S E	3	S E	4	S E	2	5	6	41	33	------	----	----	----
100	St.	00	--------	00	--------	S	3	S W	12	S W	14	4	4	54	33	------	----	----	----
100	Cir. Cu.	100	Cir.	100	Cu. St.	W	17	S W	18	N W	14	5	6	62	22	7 P. M.	8:30 P. M.	.32	----
100	Cir. St.	60	Cu.	80	Cu. St.	N W	3	N W	9	N W	2	5	6	24	18	------	----	----	----
100	Nim.	100	Cu. St.	60	--------	N W	5	N W	8	N W	7	4	5	33	24	------	----	----	----
100	Cir. St.	100	Nim.	00	--------	----	0	S	5	S E	8	6	5	38	32	8 A. M.	----	----	----
00	--------	100	Cir. St.	100	Nim.	N E	13	N E	9	N W	1	6	9	53	31	------	----	----	----
100	Nim.	90	Cu.	00	--------	N E	4	N E	4	N	4	7	6	41	24	------	10 A. M.	.88	----
10	Cir. St.	10	Cir.	00	--------	E	11	E	9	E	3	5	4	48	29	------	----	----	----
100	St.	100	Nim.	100	Nim.	S E	3	N E	8	S	2	6	3	39	33	1 P. M.	5 P. M.	.30	1
100	St.	100	St.	100	St.	W	3	N W	8	----	0	3	2	39	37	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	3.12	1
84	--------	73	--------	58	--------	----	--	----	--	----	--	4.7	4.9	49°.3	33°.2	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air. 7 A. M.	2 P. M.	9 P. M.	Daily Mean.	Pressure of Vapor, in Inches. 7 A. M.	2 P. M.	9 P. M.	Relative Humidity, or Percentage of Saturation. 7 A. M.	2 P. M.	9 P. M.	Barometer, Reduced to Freezing Point. 7 A. M.	2 P. M.	9 P. M.	Mean.
1	38	47	37	40⅔	.229	.249	.199	100	77	90	29.016	29.011	28.988	29.015
2	32	58	40	43⅓	.162	.153	.203	89	32	82	28.993	28.958	28.950	28.967
3	46	58	39	47⅔	.192	.203	.152	62	43	63	28.941	28.886	28.873	28.900
4	38	58	40	45⅓	.144	.104	.160	63	22	64	28.831	28.780	28.748	28.786
5	35	50	40	41⅔	.162	.361	.203	80	100	82	28.660	28.585	28.624	28.623
6	31	53	39	42	.175	.116	.131	89	36	55	28.695	28.745	28.848	28.763
7	39	54	46	46⅓	.110.	.133	.146	46	32	47	29.016	29.010	28.995	29.007
8	43	60	51	51⅓	.231	.177	.173	83	34	46	29.000	28.903	28.883	28.929
9	49	56	61	55⅓	.318	.391	.413	100	87	77	28.766	28.602	28.607	28.658
10	48	61	51	53⅓	.260	.138	.173	78	26	46	28.748	28.728	28.740	28.735
11	47	61	52	53⅓	.179	.138	.183	55	26	47	28.719	28.635	28.660	28.671
12	46	61	47	51⅓	.192	.114	.156	62	21	48	28.705	28.687	28.755	28.716
13	43	58	43	48	.164	.153	.186	59	32	67	28.909	28.913	28.948	28.923
14	44	56	43	47⅔	.196	.179	.254	68	40	92	29.019	28.993	29.005	29.008
15	43	55	41	46⅓	.231	.218	.212	83	50	82	29.030	29.053	29.129	29.071
16	42	66	48	52	.222	.259	.285	83	40	85	29.190	29.182	29.219	29.197
17	48	67	52	55⅔	.236	.216	.282	70	37	73	29.254	29.176	29.176	29.202
18	53	66	61	60	.269	.376	.383	67	59	71	29.070	29.015	29.027	29.037
19	61	74	61	65⅓	.473	.442	.537	88	55	100	29.039	28.953	28.888	28.960
20	57	67	55	59⅔	.378	.246	.269	81	37	62	28.844	28.824	28.897	28.855
21	53	68	59	60	.219	.290	.323	54	42	65	29.049	29.019	28.987	29.045
22	56	50	52	52⅔	.282	.361	.388	63	100	100	28.862	28.855	28.825	28.847
23	56	64	62	60⅔	.419	.596	.491	100	100	88	28.758	28.617	28.657	28.677
24	60	71	49	60	.487	.503	.348	94	63	100	28.531	28.333	28.447	28.437
25	50	48	50	49⅓	.361	.189	.335	100	56	93	28.572	28.639	28.695	28.635
26	52	53	50	51⅔	.334	.321	.361	86	80	100	28.743	28.755	28.845	28.814
27	49	59	51	53	.348	.323	.374	100	65	100	28.880	28.900	28.972	28.917
28	51	55	53	53	.374	.349	.321	100	81	89	29.035	29.015	28.994	29.028
29	53	64	53	56⅔	.348	.343	.375	86	57	93	28.906	28.857	28.897	28.887
30	52	75	63	63⅓	.361	.359	.386	93	40	67	28.937	28.904	28.947	28.927
31	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	-------
Sums.	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	-------
Means	------	------	------	50°.55	.270	.268	.269	79	52	76	--------	--------	--------	28.874
Average						.269			69					

THE MONTH OF APRIL, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melted Snow.	Depth of Snow.
100	St.	100	Cu. St.	00	--------	S W	3	N W	6	----	0	5	1	51	32	------	----	----	----
10	Cir.Cu.	90	Cu.	00	--------	----	0	N W	3	----	0	5	6	59	32	------	----	----	----
80	Cir.Cu.	100	Cu.	00	--------	N E	3	N E	5	N E	5	4	6	62	32	------	----	----	----
00	--------	00	--------	00	--------	N	6	N	9	N	5	4	3	60	29	------	----	----	----
100	Cir. St.	100	Cu. St.	00	--------	W	2	W	8	N W	6	4	6	54	34	2 P. M.	2:30 P. M.	.01	----
100	Cu. St.	30	Cu.	00	--------	N W	10	N W	15	N W	5	5	4	54	29	------	----	----	----
00	--------	10	Cir.	100	St.	N W	5	S W	6	----	0	3	4	55	39	------	----	----	----
100	Cir.Cu.	00	--------	100	Cir. St.	----	0	E	9	S E	5	4	5	66	44	------	----	----	----
100	Nim.	100	Cu.	90	Cir.	S E	8	S E	12	S E	7	6	7	63	47	4 A. M.	11 A. M.	.48	----
20	Cu.	00	--------	50	Cir.Cu.	S W	12	S W	16	S W	7	5	5	62	41	------	----	----	----
60	Cir. St.	70	Cu.	80	Cu.	S W	12	S W	13	S W	6	4	3	62	42	------	----	----	----
00	--------	10	Cu.	10	Cir.	S W	7	W	18	W	4	4	3	62	31	------	----	----	----
00	--------	30	Cir.	10	Cir.	N W	8	N W	13	----	0	4	4	61	38	------	----	----	----
70	Cir.Cu.	100	St.	100	Nim.	N E	6	E	6	N E	5	5	6	59	40	6 P. M.	N't.	.24	----
100	St.	90	Cir.Cu.	90	Cir.	N E	7	N E	11	N E	5	3	4	56	33	------	----	----	----
00	--------	5	Cu.	00	--------	N E	4	N E	4	E	3	4	3	66	38	------	----	----	----
00	--------	90	Cir. St.	60	Cir. St.	E	2	S E	7	----	0	3	5	69	44	------	----	----	----
30	Cir.	100	Cir.Cu.	90	Cu.	S E	3	S E	8	S E	5	4	2	68	53	------	----	----	----
90	Cir.	70	Cu.	50	Cir.	----	0	S E	8	S W	6	4	7	75	55	5 P. M.	N't.	.50	----
00	--------	00	--------	00	--------	W	7	S W	15	S W	5	4	5	69	42	------	----	----	----
30	Cir.	70	Cir.	100	St.	N W	5	N W	2	N W	3	4	5	68	52	------	----	----	----
100	Cu. St.	100	Nim.	100	St.	S E	2	S W	2	S E	1	3	4	60	47	10 A. M.	----	----	----
100	St.	100	Nim.	100	Nim.	S E	6	S E	9	S E	2	5	8	71	56	------	----	----	----
100	Nim.	90	Cu.	100	Nim.	S E	6	S	13	S W	14	7	6	71	48	------	----	----	----
100	Cu. St.	100	Cu.	100	St.	S W	9	W	10	----	0	5	5	52	48	------	----	----	----
100	St.	100	St.	50	Cu. St.	----	0	S W	5	----	0	6	3	59	46	------	----	----	----
100	St.	90	Cu.	100	Nim.	N E	4	N E	7	N E	7	6	5	61	49	------	----	----	----
100	St.	100	Cu. St.	100	St.	N W	9	N	12	N	5	4	6	56	50	------	4 P. M.	2.51	----
60	Cir. St.	100	Nim.	20	Cu.	N W	9	N E	8	----	0	4	2	67	47	------	----	----	----
00	--------	50	Cu.	100	Nim.	----	0	S W	7	W	5	3	3	75	52	In Night.	----	.02	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	3.76	----
58	--------	66	--------	53	--------	----	--	----	--	----	--	4.4	4.5	62°.4	46°	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer. Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	58	63	49	56⅔	.282	.295	.318	58	73	100	29.059	29.035	29.002	29.032
2	57	74	60	63⅔	.407	.463	.578	87	56	100	28.792	28.600	28.684	28.692
3	51	61	46	52⅔	.321	.303	.238	86	46	77	28.755	28.758	28.867	28.793
4	46	54	46	48⅔	.238	.206	.215	77	49	69	28.848	28.826	28.848	28.831
5	50	55	44	49⅔	.234	.218	.218	65	50	76	28.813	28.810	28.900	28.841
6	50	61	56	56⅔	.283	.257	.336	78	43	75	29.019	28.960	28.850	28.943
7	63	68	57	62⅔	.416	.509	.436	72	75	94	28.758	28.815	28.872	28.815
8	52	55	47	51⅓	.388	.405	.323	100	94	100	28.765	28.798	28.895	28.819
9	48	57	47	50⅔	.236	.191	.225	70	41	70	28.946	28.981	29.026	28.98
10	43	46	41	43⅓	.254	.192	.147	92	62	57	29.038	29.049	29.096	29.061
11	40	50	42	44	.182	.162	.199	73	45	74	29.156	29.111	29.144	29.138
12	40	50	41	43⅔	.160	.162	.169	64	45	65	29.167	29.103	29.115	29.128
13	38	52	42	44	.208	.136	.199	91	35	74	29.170	29.138	29.133	29.147
14	42	55	41	46	.177	.144	.190	66	33	74	29.149	29.086	29.076	29.104
15	47	59	43	49⅔	.202	.091	.269	62	18	75	29.154	29.139	29.100	29.131
16	47	62	48	52⅓	.225	.176	.212	75	32	63	29.101	29.023	29.058	29.061
17	49	66½	54	56½	.272	.143	.231	78	22	55	29.093	29.098	29.156	29.116
18	53	65	53	57	.241	.244	.269	60	39	67	29.202	29.130	29.025	29.119
19	54	69	63	62	.420	.599	.510	94	85	88	28.905	28.797	28.797	28.833
20	63	65	54	60⅔	.478	.330	.335	83	53	80	28.825	28.847	29.025	28.899
21	51	57	51	53	.296	.295	.348	79	63	93	29.128	29.225	29.288	29.214
22	50	68	54	57⅓	.309	.290	.231	85	42	55	29.339	29.263	29.210	29.281
23	56	67	61	61⅓	.255	.274	.325	57	41	61	29.190	29.075	28.928	29.064
24	60	75	64	66⅓	.426	.350	.343	82	40	57	28.949	29.077	28.954	28.987
25	65	70	54	63	.420	.293	.256	68	40	61	28.909	28.851	28.817	28.859
26	63	67	51	60⅓	.386	.218	.296	67	33	79	28.815	28.812	28.849	28.829
27	55	67	52	58	.376	.393	.308	87	59	79	28.885	28.912	28.989	28.929
28	48	68	52	56	.236	.290	.308	70	42	79	29.128	29.115	29.125	29.123
29	50	51	48	49⅔	.309	.374	.335	85	100	100	29.159	29.090	29.095	29.114
30	48	63	51	54	.285	.327	.296	85	57	79	29.209	29.259	29.317	29.262
31	51	71	58	61	.321	.363	.309	86	43	64	29.349	29.279	29.256	29.261
Sums.	------	------	------	------	------	------	------	------	----	------	--------	--------	--------	------
Means	------	------	------	51°.57	.3 2	.280	.288	77	50	75	--------	--------	--- ----	29.020
Average						.290			61					

THE MONTH OF MAY, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
30	Cir. St.	100	Cu. St.	100	Nim.	S W	4	S W	2	S W	1	4	7	73	49	2:30 P. M.	----	---	----
70	Cu.	100	Cu.	100	St.	S E	2	S W	19	S W	8	5	7	77	49	------	N't	1.02	----
100	Cu. St.	90	Cu.	00	--------	W	4	S W	4	N W	3	3	4	64	38	------	----	----	----
00	--------	70	Cu.	100	Cu.	S W	6	S W	7	S W	2	4	4	54	41	------	----	----	----
30	Cu.	90	Cu.	00	--------	W	9	W	11	----	0	3	3	59	37	------	----	----	----
10	Cir.	100	Cir. St.	100	Cu. St.	S W	4	S W	7	S E	9	4	5	67	50	Show	er.	.06	----
90	Cu.	100	Cu. St.	100	Cu. St.	S W	5	W	7	----	0	3	5	76	49	2:15 P. M.	----	----	----
100	Nim.	100	Cu. St.	00	--------	W	3	N W	6	----	0	5	5	55	42	------	8 A. M.	.93	----
00	--------	80	Cu.	100	Cir. Cu.	N W	8	W	15	N W	3	6	5	59	39	Show	er.	01	----
100	Cu. St.	100	Cu.	00	--------	W	6	W	9	N W	3	4	6	50	32	Show	er.	.01	----
100	Cu. St.	90	Cu.	100	Cir. Cu.	W	7	W	10	N W	1	6	5	53	35	------	----	----	----
10	Cir.	90	Cu.	30	Cir.	N W	7	N W	10	----	0	4	3	50	29	------	----	----	----
00	--------	60	Cu.	90	Cir. Cu.	----	0	N W	6	----	0	4	5	58	32	------	----	----	----
50	Cir.	00	--------	00	--------	N E	4	N W	5	----	0	5	4	57	34	------	----	----	----
00	--------	30	Cir. Cu.	00	--------	S W	2	N E	4	----	0	5	4	64	39	------	----	----	----
100	Cir. Cu.	90	Cir·Cu.	100	Cir. St.	S W	3	S E	5	----	0	5	3	64	41	------	----	----	----
00	--------	50	Cu.	50	Cir. St.	S	1	N E	4	E	2	3	5	69	44	------	----	----	----
100	Cir. St.	100	Cir. Cu.	100	Nim.	E	2	S E	7	S E	5	4	6	69	49	4 P. M.	----	----	----
100	Nim.	100	Cu.	10	Cu.	S E	5	S W	8	----	0	5	5	72	56	------	12¼ P. M.	.57	----
00	--------	30	Cu.	100	Cu. St.	S W	8	S W	15	N W	4	5	4	68	50	Show	er.	.07	----
100	Cu. St.	100	Cu. St.	50	Cu. St.	N W	8	N W	6	----	0	3	3	59	38	------	----	----	----
00	--------	10	Cir.	00	--------	N W	2	S	3	S	2	3	4	68	45	------	----	----	----
50	Cir. St.	100	Cir. St	100	Cir. St.	S E	8	S	8	S E	8	4	4	70	56	11 P. M.	12 M.	.17	----
00	--------	5	Cu.	50	Cir. St.	W	10	W	15	S W	8	2	3	77	57	------	----	----	----
00	--------	80	Cir. St.	00	--------	W	7	W	12	W	1	4	4	74	50	------	----	----	----
00	--------	90	Cu.	10	Cu.	S W	5	W	14	----	0	4	3	71	44	------	----	----	----
100	Cu. St.	90	Cu.	00	--------	N W	3	N W	3	----	0	3	3	68	39	------	----	----	----
00	--------	40	Cu.	10	Cir.	N W	6	N W	7	N W	2	4	3	69	48	------	----	----	----
100	Cir. St.	100	Nim.	100	Nim.	----	0	E	2	N E	3	3	2	53	46	9 A. M.	10 P. M.	.60	----
10	St.	50	Cu.	00	--------	N E	6	N E	3	----	0	4	1	67	40	------	----	----	----
20	Cir.	10	Cir.	00	--------	----	0	S	3	----	0	2	2	75	43	------	----	---	----
----	--------	----	--------	---	--------	----	--	----	--	----	--	----	----	------	------	------	----	3.44	----
43	--------	72	--------	48	--------	----	--	----	--	----	--	4.	4.1	66°.97	44°.8	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, In Open Air. 7 A. M.	2 P. M.	9 P. M.	Daily Mean.	Pressure of Vapor, in Inches. 7 A. M.	2 P. M.	9 P. M.	Relative Humidity, or Percentage of Saturation. 7 A. M.	2 P. M.	9 P. M.	Barometer, Reduced to Freezing Point. 7 A. M.	2 P. M.	9 P. M.	Mean.
1	63	76	60	66⅓	.386	.305	.310	67	34	60	29.265	29.174	29.108	29.149
2	65	72	71	69⅓	.451	.489	.469	73	62	62	28.919	28.886	28.866	28.890
3	69	82	65	72	.564	.460	.420	79	42	68	28.811	28.846	28.813	28.823
4	62	61	49	57⅓	.460	.325	.247	83	61	71	28.934	29.049	29.162	29.048
5	48	67	54	56⅓	.285	.333	.335	85	56	89	29.300	29.272	29.252	29.275
6	55	73	57	61⅔	.243	.283	.378	56	35	81	29.250	29.139	29.072	29.153
7	57	67	51	58⅓	.350	.522	.374	75	79	100	28.952	28.851	28.861	28.888
8	48	51	43	47⅓	.335	.374	.278	100	100	100	28.834	28.851	28.897	28.861
9	56	64	52	57⅓	.363	.285	.334	81	48	86	28.862	28.842	28.827	28.844
10	51	66	48	55	.321	.316	.335	86	49	100	28.855	28.848	28.937	28.879
11	50	59	48	52⅓	.283	.323	.310	78	65	92	28.989	28.967	29.031	28.996
12	51	70	51	57⅓	.321	.385	.348	86	53	93	29.109	29.137	29.239	29.158
13	60	76	58	64⅔	.396	.369	.365	76	41	76	29.339	29.289	29.296	29.311
14	64	77	56	65⅔	.373	.356	.363	62	38	81	29.325	29.204	29.186	29.238
15	64	75	68	69	.433	.628	.612	73	73	90	29.091	28.973	28.713	28.937
16	67	77	63	69	.591	.492	.478	89	53	83	28.876	28.880	28.983	28.913
17	55	73	59	62⅓	.376	.409	.439	87	50	88	29.094	29.081	29.091	29.089
18	62	74	57	64⅓	.340	.300	.407	61	36	87	29.168	29.088	29.081	29.112
19	62	81	60	67⅔	.370	.403	.456	66	38	88	29.125	29.033	28.996	29.031
20	59	69	64	64	.439	.671	.596	88	95	100	28.877	28.716	28.666	28.753
21	58	55	48	53⅔	.423	.433	.335	88	100	100	28.662	28.704	28.811	28.726
22	51	51	52	52⅓	.374	.390	.388	100	93	100	28.858	28.901	28.957	28.905
23	53	68	60	60⅓	.375	.380	.367	93	56	71	29.005	28.987	29.019	29.004
24	59	82	64	68⅓	.439	.534	.433	88	49	73	29.095	29.056	29.058	29.069
25	59	86	67	70⅔	.469	.557	.556	94	45	81	29.097	29.039	29.015	29.040
26	74	82	66	74	.604	.460	.536	73	42	84	29.003	28.989	29.075	29.022
27	66	84	64	71⅓	.570	.584	.529	89	50	89	29.181	29.167	29.202	29.183
28	66	88	68	74	.570	.530	.577	89	40	85	29.271	29.217	29.197	29.228
29	74	92	77	81	.641	.596	.601	77	40	65	29.212	29.137	29.138	29.162
30	78	88	72	79⅓	.704	.704	.668	73	73	86	29.147	29.090	29.078	29.105
31	......	......	......	......	......	......	......	......	......	......	....	....	....	....
Sums.	......	......	......	......	......	......	......	......	......	......	....	....	....	....
Means	......	......	......	64°.08	.428	.473	.423	80	56	81	....	....	....	29.030
Average	....					.411			73		....			

THE MONTH OF JUNE, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
5	St.	90	Cir. St.	00	--------	S E	3	S	6	S	2	3	4	77	56	------	----	----	----
100	Cir. St.	100	Cu. St.	00	--------	S W	5	S W	5	S E	1	3	4	77	63	In Night.	----	.09	----
80	Cir. St.	5	Cir.	00	--------	S W	4	S W	6	----	0	4	5	84	60	------	----	----	----
100	Cu.	100	Cu.	5	St.	W	3	W	10	N W	6	2	4	67	40	------	----	----	----
00	--------	30	Cu.	60	Cir. Cu.	W	4	N W	8	----	0	4	5	70	40	------	----	----	----
10	Cir.	60	Cir. Cu.	20	St.	S	4	S E	4	S W	4	5	2	75	51	------	----	----	----
100	Cu. St.	90	Cir. Cu.	100	St.	S W	3	N E	2	N E	4	3	5	70	48	11 A. M.	----	----	----
100	Nim.	100	St.	00	--------	N	3	S E	1	----	0	5	2	57	43	------	10 A.M.	1.61	----
50	Cir. St.	100	Cir. St.	90	Cir. St.	E	3	E	10	----	0	3	1	66	43	------	----	----	----
90	Cir. St.	70	Cir. Cu.	80	Cu.	E	11	W	9	----	0	4	3	68	45	------	----	----	----
00	--------	90	Cu.	00	--------	W	8	W	7	W	2	3	1	68	39	Shower.	----	.13	----
00	--------	50	Cu.	00	--------	W	2	W	3	----	0	3	2	72	42	------	----	----	----
00	--------	30	Cu.	30	Cir.	N E	1	N E	3	N E	1	3	2	77	46	------	----	----	----
60	Cir.	00	--------	00	--------	E	1	E	2	----	0	2	4	78	49	------	----	----	----
00	--------	100	Cu. St.	10	Cir. St.	S	3	S W	6	S W	6	3	3	83	60	In Night.	----	.20	----
30	Cu.	40	Cu.	10	St.	S W	6	N W	10	N W	2	3	3	79	48	------	----	----	----
60	Cir.	50	Cu.	00	--------	N W	2	W	2	----	0	4	3	75	47	------	----	----	----
00	--------	10	Cu.	00	--------	N E	1	S	1	----	0	4	4	77	50	------	----	----	----
00	--------	80	Cu.	00	--------	W	3	S W	5	----	0	4	4	81	50	------	----	----	----
100	Nim.	90	Cu.	100	Cu. St.	S W	4	S W	5	S W	4	5	6	75	55	6 A. M.	----	----	----
100	Cu. St.	100	Nim.	100	Nim.	S W	1	N	9	N	6	2	4	62	48	------	----	----	----
100	Nim.	100	Nim.	100	Cu. St.	N	6	N W	6	N W	3	2	2	51	51	------	N't.	1.12	----
100	St.	60	Cir.	30	Cir.	W	6	N W	12	S W	3	3	3	72	47	------	----	----	----
00	--------	10	Cir.	00	--------	N W	4	S W	7	S W	2	3	1	83	50	------	----	----	----
50	Cir. Cu.	60	Cu.	00	--------	----	0	S W	3	----	0	3	4	87	59	------	----	----	----
100	Cu.	60	Cu.	00	--------	S W	9	S W	10	----	0	3	2	84	57	------	----	----	----
00	--------	40	Cu.	00	--------	----	0	S W	3	----	0	3	1	87	53	------	----	----	----
00	--------	00	--------	00	--------	S W	1	S W	3	----	0	3	2	90	61	------	----	----	----
10	Cir. St.	40	Cu.	50	Cir. St.	S W	1	S W	5	S W	3	1	3	91	65	------	----	----	----
90	Cir. St.	60	Cu.	00	--------	S W	2	S W	4	----	0	2	1	93	65	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	3.15	----
48	--------	60	--------	27	--------	----	--	----	--	----	--	3.11	3.	75°.7	51°.	------	----	----	----
		45																	

METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	78	88	69	$78\frac{1}{3}$	.704	.692	.635	73	52	90	29.086	29.000	29.061	29.049
2	58	63	61	$60\frac{2}{3}$	.483	.576	.537	100	100	100	29.156	29.164	29.186	29.169
3	63	66	64	$64\frac{1}{3}$	.510	.570	.563	88	89	94	29.219	29.219	29.239	29.228
4	69	80	68	$72\frac{1}{3}$	.599	.717	.685	85	70	100	29.279	29.235	29.218	29.227
5	68	86	69	$74\frac{1}{3}$	.612	.677	.671	90	54	95	29.199	29.200	29.174	29.191
6	76	88	73	79	.541	.416	.812	60	31	100	29.208	29.104	29.089	29.134
7	71	77	72	$74\frac{1}{3}$	.641	.678	.668	77	73	86	29.112	29.082	29.025	29.073
8	73	88	72	$77\frac{2}{3}$	.732	.727	.745	90	56	95	29.000	28.989	28.999	29.003
9	74	87	73	78	.718	.704	.668	86	56	86	29.087	29.041	29.069	29.066
10	68	82	71	$73\frac{2}{3}$	.612	.610	.682	90	56	90	29.115	29.177	29.207	29.166
11	68	80	70	$72\frac{2}{3}$	.648	.758	.695	95	74	95	29.268	29.220	29.172	29.220
12	71	84	73	76	.720	.832	.732	95	72	90	29.125	29.114	29.137	29.125
13	73	83	71	$75\frac{2}{3}$	.693	.637	.682	85	56	90	29.202	29.178	29.144	29.175
14	78	88	73	$79\frac{2}{3}$	.785	.692	.732	82	52	90	29.109	29.068	29.045	29.074
15	70	93	73	$78\frac{2}{3}$	.695	.710	.732	95	46	90	29.075	29.044	29.055	29.058
16	77	94	77	$82\frac{2}{3}$	.678	.787	.841	73	49	91	29.086	29.022	29.000	29.036
17	83	97	80	$84\frac{1}{3}$	.846	.840	.843	75	48	83	29.028	29.006	29.084	29.039
18	80	81	68	$76\frac{1}{3}$	.843	.745	.648	83	70	95	28.958	28.975	29.026	28.986
19	69	92	74	$78\frac{1}{3}$	.671	.680	.758	95	46	90	29.075	29.048	29.058	29.060
20	75	93	75	81	.628	.624	.666	73	40	77	29.066	29.003	28.955	29.008
21	70	76	63	$69\frac{2}{3}$	.658	.436	.356	90	49	62	28.999	29.022	29.080	29.034
22	61	79	60	$66\frac{2}{3}$	.383	.296	.456	71	30	88	29.159	29.158	29.174	29.164
23	55	81	61	$65\frac{2}{3}$	.433	.745	.412	100	70	83	29.268	29.221	29.214	29.234
24	63	85	63	$70\frac{1}{3}$	.478	.350	.478	83	29	83	29.225	29.135	29.040	29.133
25	71	72	64	69	.537	.595	.563	71	76	94	28.966	28.923	28.856	28.915
26	62	67	67	$65\frac{1}{3}$	.556	.662	.626	100	100	95	28.671	28.668	28.808	28.716
27	61	79	60	$66\frac{2}{3}$	.413	.501	.456	77	51	88	29.027	29.053	29.113	29.064
28	62	78	64	68	.460	.409	.497	83	43	83	29.238	29.194	29.164	29.199
29	63	64	59	62	.543	.497	.439	94	83	88	29.127	29.077	29.039	29.081
30	66	76	63	$68\frac{1}{3}$	.502	.505	.543	78	56	94	29.029	29.021	29.028	29.026
31	73	82	69	$74\frac{2}{3}$	.655	.731	.529	81	67	75	29.008	28.955	28.957	28.973
Sums.	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	--------
Means	------	------	------	73°.04	.645	.627	.645	84	60	60	--------	--------	--------	29.084
Average						.639			68					

THE MONTH OF JULY, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melted Snow.	Depth of Snow.
30	Cir.Cu.	90	Cu.	100	Cu. St.	----	0	S W	10	S W	5	2	3	93	57	5 P. M.	----	----	----
100	Nim.	100	Nim.	100	St.	N W	4	N W	6	N E	3	2	4	63	58	------	----	----	----
100	St.	100	St.	100	St.	N E	2	N E	4	----	0	1	1	69	63	------	3 P. M.	.35	----
100	St.	70	Cu.	00	--------	N E	2	S	1	----	0	1	1	83	65	------	----	----	----
100	St.	50	Cu.	00	--------	E	1	E	2	----	0	2	0	88	59	------	----	----	----
00	--------	00	--------	20	Cu.	----	0	S E	0	----	0	1	2	90	64	------	----	----	----
70	Cir. Cu.	100	Cir. St.	10	Cir.	S E	2	S W	3	----	0	2	2	79	67	------	----	----	----
100	Cu. St.	00	--------	5	Cir.	S	3	S W	5	----	0	2	2	90	60	Shower.	----	.15	----
00	--------	00	--------	100	Cir.Cu.	----	0	S W	2	----	0	1	1	89	63	10 P. M.	12 M	.42	----
00	--------	90	Cir.Cu.	90	Cir.Cu.	W	4	W	2	----	0	3	1	84	64	Night	----	----	----
100	Cu. St.	90	Cu.	100	Nim.	----	0	----	0	S W	3	3	2	81	66	------	----	----	----
100	Cu. St.	60	Cu.	90	Cir.	S W	2	E	2	E	1	2	3	85	67	------	10 P. M.	.25	----
90	Cu.	60	Cu.	00	--------	N E	1	S W	1	----	0	2	1	88	65	------	----	----	----
50	Cu.	90	Cir.	00	--------	S W	3	S W	2	----	0	1	0	92	63	------	----	----	----
90	Cir.Cu.	60	Cu.	00	--------	----	0	S W	4	S W	2	2	3	94	67	------	----	----	----
00	-------	30	Cu.	00	--------	S W	3	S W	4	----	0	2	3	95	74	------	----	----	----
00	--------	40	Cu.	00	--------	S W	3	S W	5	----	0	2	1	98	76	------	----	----	----
00	--------	80	Cu.	00	--------	S W	4	W	8	----	0	2	0	93	60	------	----	----	----
00	--------	60	Cir. St.	50	Cir. St.	N W	1	N E	3	----	0	1	0	93	69	------	----	----	----
90	Cir.Cu.	20	Cu.	00	--------	N W	4	W	5	W	3	2	1	93	64	------	----	----	----
30	Cu.	90	Cu.	00	--------	N W	6	N E	6	N E	5	2	3	79	51	------	----	----	----
00	--------	10	Cir.	10	St.	N	5	N	7	----	0	2	1	80	47	------	----	----	----
00	--------	00	--------	50	Cir. St.	----	0	N W	3	----	0	3	2	81	48	------	----	----	----
00	--------	00	--------	20	Cir. St.	----	0	W	4	----	0	3	4	87	59	------	----	----	----
100	Cir. St.	100	Cir. Cu.	100	Cir. St.	S W	1	N E	2	----	0	3	2	76	61	9 A. M.	----	----	----
100	Nim.	100	Cu. St.	80	Cu.	N E	1	N	7	N	4	2	3	72	52	------	1 P. M.	1.62	----
00	--------	30	Cu.	60	--------	N W	1	N W	6	----	0	2	2	79	49	------	----	----	----
5	St.	10	Cir.	30	St.	W	1	N E	1	----	0	3	1	80	60	------	----	----	----
100	Nim.	100	Nim.	100	Cu. St.	S E	1	N E	1	----	0	3	3	66	58	6 A. M.	4 P. M.	.09	----
80	Cir.Cu.	90	Cu.	00	--------	N E	2	----	0	----	0	4	1	80	58	------	----	----	----
20	Cir.Cu.	40	Cu.	5	St.	S W	5	W	8	----	0	2	1	85	64	Showers.	----	.08	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	- -	--- --	------	------	----	2.96	----
50	--------	23	--------	37	--------	----	--	----	--	----	--	2	1.7	84°	61°.2	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	70	84	68	74	.586	.584	.543	80	50	79	28.943	28.894	28.937	28.925
2	71	84	65	$73\frac{1}{3}$	.608	.545	.516	80	47	84	28.973	28.926	28.925	28.941
3	70	87	66	$74\frac{1}{3}$	.551	.543	.536	75	42	84	28.968	28.938	28.945	28.950
4	76	87	66	$76\frac{1}{3}$	.577	.664	.604	64	52	94	28.947	28.894	28.929	28.907
5	70	88	67	75	.658	.569	.591	90	42	89	28.950	28.881	28.865	28.899
6	67	79	64	71	.591	.465	.464	89	47	77	28.877	28.892	28.977	28.915
7	66	83	67	72	.536	.483	.556	84	43	84	29.036	28.992	28.977	29.002
8	75	93	71	$79\frac{2}{3}$	.705	.624	.572	81	40	76	28.927	28.850	28.827	28.868
9	73	86	69	76	.732	.557	.462	90	45	65	28.837	28.841	28.892	28.857
10	72	83	65	$73\frac{1}{3}$	.595	.597	.420	76	53	68	28.926	28.915	28.972	28.938
11	67	78	60	$68\frac{1}{3}$	.489	.478	.396	75	50	76	29.011	29.035	29.060	29.035
12	62	78	62	$67\frac{1}{3}$	.429	.375	.460	77	39	83	29.104	29.063	29.006	29.058
13	61	80	64	$68\frac{1}{3}$	.505	.843	.529	94	83	89	28.937	28.943	28.903	28.934
14	66	80	66	$70\frac{2}{3}$	.502	.843	.639	78	83	100	28.871	28.883	28.933	28.896
15	64	83	63	70	.529	.447	.576	89	40	100	28.992	29.000	29.084	29.025
16	64	78	58	$66\frac{2}{3}$	.596	.550	.423	100	58	88	29.134	29.117	29.128	29.126
17	60	78	61	$66\frac{1}{3}$	.426	.478	.473	82	50	88	29.178	29.154	29.118	29.147
18	74	79	68	$73\frac{2}{3}$	.568	.574	.648	67	58	95	29.085	29.033	29.010	29.043
19	70	84	75	$76\frac{1}{3}$	.695	.704	.628	95	60	73	28.993	28.942	28.932	28.956
20	62	81	62	$68\frac{1}{3}$	.491	.547	.491	88	52	88	29.008	28.997	29.033	29.013
21	59	81	57	$65\frac{2}{3}$	.469	.585	.407	94	56	87	29.107	29.090	29.116	29.104
22	62	81	64	69	.491	.474	.529	88	45	89	29.178	29.145	29.134	29.142
23	68	83	69	$73\frac{1}{3}$	.543	.558	.635	79	50	90	29.172	29.075	29.057	29.101
24	73	80	73	$75\frac{1}{3}$	.655	.758	.655	81	74	81	28.963	28.937	28.935	28.945
25	59	73	53	$61\frac{2}{3}$	.323	.223	.348	65	27	86	29.077	29.081	29.064	29.074
26	50	79	51	60	.348	.296	.374	93	30	100	29.110	29.067	29.040	29.072
27	51	77	63	$63\frac{2}{3}$	.348	.356	.478	93	38	83	29.040	29.011	28.964	29.038
28	64	69	63	$65\frac{1}{3}$	.563	.430	.543	94	61	94	28.962	28.957	28.057	28.959
29	63	75	61	$66\frac{1}{3}$	.543	.484	.505	94	56	94	29.158	29.166	29.198	29.167
30	57	80	61	66	.436	.523	.505	94	51	94	29.240	29.261	29.141	29.214
31	62	72	68	$67\frac{1}{3}$	.556	.745	.685	100	95	100	29.084	28.983	29.016	29.028
Sums.	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Means	------	------	------	70°.15	.537	.545	.522	81	52	87	------	------	------	29.009
Average					.535			74			------			

THE MONTH OF AUGUST, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
90	Cir. St.	60	Cu.	00	--------	W	5	W	8	----	0	4	3	85	61	------	----	----	----
00	--------	50	Cu.	00	--------	W	2	S W	7	----	0	3	1	88	53	------	----	----	----
00	--------	50	Cu.	00	--------	----	0	W	4	----	0	2	1	89	60	------	----	----	----
30	Cir. St.	90	Cu.	00	--------	----	0	S	4	----	0	2	1	92	59	------	----	----	----
40	Cu.	30	Cir.Cu.	10	Cir. St.	E	1	S W	6	----	0	3	2	89	63	In Night.	----	.09	----
10	Cu.	80	Cu.	00	--------	N W	4	N W	6	----	0	3	1	84	52	------	----	----	----
00	--------	100	Cu.	10	Cir.	N W	1	S W	8	----	0	2	2	87	65	------	----	----	----
10	Cu.	20	Cir. St.	10	Cir. St.	W	6	S W	7	S W	4	3	3	93	67	------	----	----	----
10	Cu.	10	Cir. St.	30	Cir.Cu.	W	5	W	9	----	0	2	2	86	60	------	----	----	----
90	Cir. St.	90	Cir. St.	5	Cir.	----	0	S W	7	----	0	2	3	83	53	------	----	----	----
00	--------	40	Cu.	00	--------	----	0	N E	6	----	0	2	1	82	45	------	----	----	----
5	Cir.	90	Cir.Cu.	00	--------	----	0	W	2	----	0	3	1	83	51	------	----	----	----
10	Cir.	100	Nim.	10	Cir. St.	S W	2	S	6	----	0	3	3	88	60	2 P. M.	3 P. M.	.24	----
90	Cir. St.	100	Cu. St.	100	Nim.	S W	1	S W	2	S W	5	2	4	82	60	2 P. M.	10 P. M.	.40	----
10	Cir.	100	Nim.	10	Cir. St.	S W	5	S	10	----	0	3	2	85	61	2 P. M.	Nt.	.42	----
90	Cir.Cu.	90	Cu.	00	--------	S W	4	S W	6	----	0	2	1	80	48	------	----	----	----
10	Cir. St.	30	Cu.	00	--------	----	0	W	5	----	0	1	1	78	52	------	----	----	----
100	Cu.	90	Cu.	00	--------	----	0	S W	2	----	0	1	1	83	66	------	----	----	----
100	Nim.	60	Cu.	90	Cir. St.	----	0	W	4	N W	4	2	1	84	57	------	----	----	----
10	Cir.	30	Cu.	00	--------	N E	2	N E	2	N E	1	2	1	81	48	------	----	----	----
60	--------	00	--------	00	--------	N E	2	N E	4	----	0	2	1	82	46	------	----	----	----
10	Cir. St.	50	Cir.Cu.	50	Cir.	----	0	N E	2	----	0	2	1	82	53	------	----	----	----
90	Cir.Cu.	100	Cu. St.	100	Nim.	S W	2	S W	6	----	0	2	2	86	62	Show	er.	.07	----
100	Cu. St.	100	Cu. St.	100	Cu. St.	S W	5	W	2	N W	6	3	2	82	52	------	----	----	----
00	--------	00	--------	00	--------	N W	10	W	5	----	0	3	0	74	39	------	----	----	----
50	Cir.	40	Cir.Cu.	00	--------	W	2	W	5	----	0	3	1	80	42	------	----	----	----
10	Cir.	50	St.	00	--------	----	0	S W	2	----	0	3	1	81	52	4:30 P. M.	4:45 P. M.	.02	----
90	Nim.	85	Cu.	00	--------	N W	3	W	1	N W	2	1	3	71	59	6:30 A. M.	1 P. M.	.41	----
50	Cir.Cu.	25	Cu.	00	--------	N W	2	N W	2	----	0	3	1	78	50	------	----	----	----
00	--------	50	Cu.	00	--------	----	0	N E	2	----	0	2	0	82	57	------	----	----	----
100	Nim.	100	St.	30	St.	----	0	E	1	----	0	1	0	75	62	6 A. M.	11 A. M.	.20	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	1.85	----
42	--------	60	--------	18	--------	----	--	----	--	----	--	2.3	1.6	83°	55°.31	------	----	----	----
		40																	

METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	65	83	66	71⅓	.618	.597	.536	100	100	84	29.071	29.065	29.057	29.064
2	67	82	65	71⅓	.591	.650	.490	89	59	81	29.041	28.949	28.977	28.989
3	62	76	66	68	.556	.541	.570	100	60	89	29.071	29.043	29.096	29.030
4	61	73	61	65	.537	.545	.537	100	67	100	29.149	29.098	29.106	29.114
5	59	81	65	68⅓	.500	.547	.549	100	52	89	29.198	29.128	29.141	29.156
6	60	89	70	73	.518	.596	.886	100	43	87	29.212	29.171	29.197	29.193
7	71	87	74	77⅓	.608	.543	.641	80	42	77	29.221	29.163	29.190	29.191
8	71	90	74	78⅓	.608	.503	.641	80	36	77	29.208	29.155	29.152	29.172
9	70	83	69	74	.586	.597	.708	80	53	100	29.106	29.028	29.012	29.049
10	62	64	55	60⅓	.556	.529	.321	100	89	74	29.040	29.146	29.209	29.132
11	41	66	54	53⅔	.257	.346	.390	100	54	93	29.273	29.243	29.256	29.257
12	51	63	55	56⅓	.348	.386	.376	93	67	87	29.242	29.169	29.132	29.181
13	51	53	48	50⅔	.348	.321	.310	93	80	92	28.993	28.979	29.052	29.011
14	51	69	53	57⅔	.321	.218	.295	86	35	73	29.136	29.156	29.253	29.182
15	48	73	54	58⅓	.335	.345	.308	100	42	74	29.392	29.318	29.276	29.329
16	55	79	67	67	.321	.465	.489	74	47	75	29.220	29.145	29.151	29.172
17	60	82	69	70⅓	.396	.497	.496	76	45	70	29.159	29.097	29.103	29.130
18	59	79	63	67	.500	.574	.576	100	58	100	29.204	29.175	29.151	29.177
19	66	83	63	70⅔	.570	.483	.576	89	43	100	29.111	28.934	28.917	28.987
20	69	66	51	62	.529	.604	.321	75	94	86	28.826	28.706	28.991	28.841
21	45	62	42	49⅔	.300	.229	.244	100	41	91	29.169	29.149	29.255	29.191
22	55	63	51	57⅓	.193	.386	.308	44	67	74	29.402	29.339	29.340	29.360
23	50	68	61	59⅔	.283	.232	.413	78	34	77	29.320	29.200	29.095	29.205
24	52	68	51	57	.388	.319	.348	100	47	93	29.195	29.229	29.242	29.222
25	62	75	61	66	.491	.554	.537	88	64	100	29.049	28.863	28.936	28.949
26	49	59	44	50⅔	.272	.269	.265	78	54	92	29.315	29.388	29.485	29.386
27	38	57	41	46⅓	.229	.242	.265	100	52	92	29.609	29.530	29.473	29.537
28	38	62	56	52	.229	.399	.363	100	72	81	29.394	29.279	29.226	29.300
29	58	69	61	63⅔	.423	.529	.529	88	75	89	29.236	29.175	29.127	29.179
30	64	81	70	71⅔	.563	.547	.551	94	52	75	29.062	28.986	28.990	29.013
31	------	------	------	------	------	------	------	------	------	------	-------	-------	-------	-------
Sums.	-----	------	------	------	------	------	------	------	------	------	-------	-------	-------	-------
Means	------	------	------	63°.15	.416	.464	.461	90	57	86	-------	-------	-------	29.156
Average	------------------					.447			78		------------------------------			

THE MONTH OF SEPTEMBER, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
100	St.	30	Cu.	00	--------	----	0	W	3	----	0	2	4	83	62	------	----	----	----
70	Cu. St.	30	Cir. St.	10	St.	S W	5	S W	8	----	0	2	1	86	61	------	----	----	----
100	St.	60	Cu.	100	St.	----	0	N W	5	----	0	3	1	77	57	------	----	----	----
100	St.	90	Cu.	00	--------	W	3	W	4	----	0	3	0	75	52	------	----	----	----
00	--------	20	Cu.	00	--------	----	0	W	3	----	0	3	0	82	55	------	----	----	----
00	--------	30	Cu.	00	--------	----	0	S W	2	----	0	2	1	90	59	------	----	----	----
00	--------	90	Cu.	30	Cir.	S W	3	S W	5	S	3	2	1	88	63	------	----	----	----
00	--------	60	Cu.	00	--------	S W	2	S W	5	S E	5	1	3	92	68	------	----	----	----
90	Cir. Cu.	100	Cir. Cu.	100	Cu. St.	S E	5	S	8	----	0	2	2	86	62	3 P.M.	----	----	----
100	Cu. St.	100	Cu. St.	90	Cir.	W	4	W	4	N W	3	2	0	65	39	------	10 A.M.	2.17	----
30	Cir. Cu.	90	Cu.	90	Cu.	W	2	N	2	N	2	3	2	68	40	------	----	----	----
100	Cu. St.	90	Cu.	100	Cir. St.	N	5	N	5	N	3	3	3	66	50	------	----	----	----
100	Cu. St.	100	Cu. St.	30	Cir.	N W	7	N W	7	N W	2	2	1	55	42	------	----	----	----
90	Cir.	00	--------	00	--------	N W	3	S W	11	----	0	2	1	70	38	------	----	----	----
50	Cir. St.	00	--------	00	--------	----	0	S W	5	----	0	2	2	73	47	------	----	----	----
00	--------	20	Cir.	00	--------	S W	5	S W	10	S W	7	2	2	79	54	------	----	----	----
30	Cir. St.	10	St.	10	St.	S W	5	S W	11	S W	5	1	0	83	56	------	----	----	----
90	St.	100	Cu. St.	10	St.	----	0	W	2	----	0	1	1	80	56	------	----	----	----
20	Cir. Cu.	70	Cu. St.	10	Cu. St.	S W	6	S W	10	N W	2	1	2	83	62	4 P. M.	6 P. M.	.08	----
80	Cu. St.	100	Nim.	100	St.	S W	10	S W	9	S W	6	2	1	73	42	11 A. M.	6 P. M.	.13	----
10	St.	70	Cu.	00	--------	----	0	W	11	----	0	2	2	63	31	------	----	----	----
90	Cu.	30	Cu. St.	00	--------	S E	2	S E	6	S E	5	3	3	65	36	------	----	----	----
80	Cir. St.	30	Cir.	50	Cir. St.	S W	7	S W	8	S E	8	4	2	68	49	In Night.	----	.25	----
00	--------	00	--------	00	--------	S W	3	W	6	----	0	3	3	68	47	------	----	----	----
100	Cu. St.	100	Cu. St.	100	Cu. St.	S E	10	S W	12	W	8	2	3	79	46	4 A. M.	6 P.M.	.68	----
10	Cu.	30	Cu.	00	--------	W	8	W	8	----	0	3	2	61	32	------	----	----	----
00	--------	10	Cir. St.	00	--------	N W	2	N E	2	----	0	3	1	58	35	------	----	----	----
100	Cu. St.	100	St.	100	St.	N E	1	S E	5	S E	5	2	1	62	37	------	----	----	----
100	St.	100	Cu. St.	100	Cu. St.	S	2	S W	5	S E	4	2	2	71	57	In Night.	----	.12	----
00	--------	10	Cu.	00	--------	S W	6	S	10	S	5	2	1	81	63	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	3.43	----
55	--------	48	--------	31	--------	----	--	----	--	----	--	2.23	1 60	74°.3	49°.9	------	----	----	----
		45																	

METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	64	81	66	70⅓	.529	.547	.604	89	52	91	28.994	28.916	28.850	28.920
2	58	71	60	63	.423	.371	.338	88	49	65	28.994	29.018	29.032	29.015
3	54	69	48	57	.335	.219	.272	80	31	78	29.090	29.099	29.112	29.110
4	51	64	46	53⅔	.348	.330	.311	93	38	100	29.186	29.196	29.230	29.204
5	46	57	38	47	.311	.322	.229	100	69	100	29.212	29.107	29.209	29.176
6	31	62	49	47⅓	.174	.202	.199	100	36	57	29.283	29.229	29.206	29.239
7	46	61	46	51	.192	.325	.286	62	61	92	29.094	29.009	29.098	29.067
8	45	68	61	58	.275	.319	.413	99	17	77	29.159	29.058	28.849	29.022
9	55	51	38	49	.349	.256	.229	81	61	100	28.950	29.083	29.220	29.084
10	31	59	47	45⅔	.171	.216	.225	100	43	70	29.266	29.203	29.095	29.188
11	47	55	36	46	.325	.405	.191	100	94	90	28.990	29.073	29.176	29.080
12	33	64	46	47⅔	.188	.257	.238	100	43	77	29.273	29.212	29.202	29.230
13	45	60	55	53⅓	.228	.255	.349	76	49	81	29.199	29.075	29.092	29.122
14	49	71	66	63	.348	.497	.407	100	59	63	29.050	28.946	28.908	28.968
15	66	72	63	67	.536	.559	.576	84	72	100	28.928	28.968	28.948	28.948
16	64	73	67	68	.461	.510	.591	77	63	89	28.892	28.783	28.718	28.789
17	46	49	43	46	.238	.199	.186	77	57	67	28.835	28.856	28.919	28.870
18	38	43	33	38	.229	.231	.188	100	83	100	28.962	29.006	29.121	29.030
19	36	49	33	39⅓	.149	.199	.188	71	57	100	29.112	29.153	29.124	29.130
20	48	65	54	55⅔	.212	.241	.206	63	39	49	29.053	28.988	29.022	29.021
21	45	67	57	56⅓	.201	.218	.212	68	33	52	29.089	28.989	28.988	29.022
22	49	41	37	42⅓	.272	.235	.157	78	91	71	28.915	28.995	29.050	29.000
23	30	46	33	36⅓	.118	.146	.168	89	47	89	29.010	28.916	29.006	28.987
24	33	51	36	40	.188	.196	.170	100	52	80	29.196	29.254	29.314	29.255
25	45	54	42	47	.219	.282	.214	77	67	91	29.201	29.294	29.364	29.286
26	40	40	32	37⅓	.225	.218	.181	91	100	100	29.102	29.261	29.242	29.303
27	32	37	28	32⅓	.181	.221	.153	100	100	100	29.231	29.112	29.288	29.224
28	21	34	33	29⅓	.113	.138	.188	100	71	100	29.319	29.254	28.905	29.166
29	34	47	42	41	.196	.156	.177	100	18	66	29.067	29.002	28.905	28.991
30	38	46	38	40⅔	.186	.262	.208	81	84	91	28.869	28.852	28.821	28.847
31	30	33	26	29⅔	.130	.150	.141	78	80	100	29.063	29.159	29.257	29.160
Sums.	......	......	......	......	......	......	......	......	......	......	....	....	....	....
Means	......	......	......	48°.33	.262	.281	.263	87	60	80	....	....	....	29.080
Average						.269			76		....			

THE MONTH OF OCTOBER, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7. A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
00	--------	00	--------	100	Nim.	S	7	S	11	S	6	3	2	82	55	7 P. M.	10 P.M.	.20	----
10	Cu.	5	Cu.	00	--------	S W	5	S W	8	S W	4	3	2	71	49	------	----	----	----
00	--------	10	Cu.	00	--------	S W	5	W	11	----	0	2	1	70	43	------	----	----	----
100	Cu. St.	20	Cu.	00	--------	----	0	W	8	----	0	1	0	65	39	------	----	----	----
100	Nim.	100	Cu. St.	00	--------	----	0	S W	5	----	0	3	0	58	27	7 A. M.	6 P.M.	.07	----
00	--------	30	Cir. St.	00	--------	----	0	W	3	W	6	2	1	63	31	------	----	----	----
100	Cu. St.	80	Cu.	00	--------	S W	5	W	7	----	0	2	3	63	40	------	----	----	----
90	Cir. St.	90	Cu.	90	Cir. Cu.	----	0	S W	9	S	5	5	3	69	44	6:30 P. M.	N't.	.21	----
100	Cu.	90	Cu.	00	--------	S W	12	N W	13	----	0	4	0	58	29	------	----	----	----
00	--------	50	Cir.	5	St.	----	0	S E	5	S E	3	2	2	59	31	------	----	----	----
100	Nim.	30	St.	00	--------	S W	2	W	10	----	0	4	0	57	30	6 A. M.	11 A.M.	.36	----
00	--------	00	--------	00	--------	S W	2	S W	6	----	0	2	2	64	33	------	----	----	----
70	St.	30	Cir. Cu.	100	St.	S W	6	S W	6	W	2	3	2	60	47	------	----	----	----
00	--------	50	Cir.	100	Cu.	----	0	S	9	S W	10	2	1	75	48	------	----	----	----
90	Cir. Cu.	100	St.	30	Cir. Cu.	S W	6	S W	4	----	0	2	2	73	59	3 P. M.	N't.	.20	----
100	Cu. St.	100	Cu.	100	Nim.	S W	10	S W	14	S W	12	2	4	74	45	In Night.	----	.17	----
100	St.	100	Cu.	100	St.	W	6	S W	10	S W	8	3	2	52	36	Shower.	----	.04	----
100	St.	90	Cu.	00	--------	S W	5	N W	8	N W	6	3	3	49	29	------	----	----	----
00	--------	5	Cir.	50	Cu.	N W	3	W	5	----	0	3	2	49	31	------	----	----	----
00	--------	20	Cir.	00	--------	S	6	S	6	----	0	2	1	65	41	------	----	----	----
00	--------	00	--------	100	Cir. St.	S	6	S	10	S	7	2	2	68	44	------	----	----	----
90	Cu.	100	Nim.	100	St.	S E	8	N E	6	N W	7	3	2	50	28	8 A. M.	3 P.M.	.06	----
5	St.	100	Cu. St.	00	--------	N W	5	W	9	----	0	3	1	48	26	------	----	----	----
100	Cir. St.	100	Cir. St.	00	--------	----	0	----	0	----	0	2	3	53	32	Night.	5 P.M.	.57	1
100	Cu. St.	100	Cu. St.	00	--------	----	0	N	5	----	0	2	2	58	38	------	----	----	----
100	St.	100	Nim.	100	Nim.	----	0	N E	1	N E	1	3	4	40	31	8 A. M.	9 A.M.	.03	----
100	St.	100	Nim.	00	--------	----	0	N W	2	N W	2	2	3	37	21	------	----	----	----
00	--------	100	St.	100	St.	----	0	----	0	S W	4	4	4	34	24	------	----	----	----
90	Cir.	90	Cir. Cu.	100	St.	S W	2	S	5	S W	3	3	4	48	33	------	----	----	----
100	Nim.	100	Nim.	100	St.	S W	4	S W	7	S W	4	1	1	48	29	Sprinkle.	----	.08	----
50	Cu.	90	Cu.	00	--------	N W	3	N W	9	N W	12	5	2	34	23	Snow Sq'lls.	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	1.99	1
58	--------	64	--------	41	--------	----	--	----	--	----	--	2.65	2.	58°	36°	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation.			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	26	48	38	37⅓	.141	.143	.144	100	43	63	29.122	28.970	28.967	29.020
2	39	48	29	38⅔	.195	.212	.160	82	63	100	28.990	29.154	29.279	29.141
3	18	43	32	31	.098	.164	.150	100	59	80	29.491	29.412	29.392	29.432
4	26	40	24	30	.123	.097	.111	87	39	86	29.449	29.420	29.442	29.437
5	27	45	41	37⅔	.109	.160	.212	88	53	82	29.402	29.257	29.060	29.240
6	39	39	33	37	.216	.216	.188	91	91	100	28.974	29.031	29.116	29.040
7	22	37	35	31¾	.118	.157	.183	100	71	90	29.119	29.032	29.091	29.081
8	37	42	39	39⅓	.178	.177	.216	81	68	91	29.213	29.209	29.269	29.230
9	34	42	41	39	.196	.222	.235	100	83	91	29.292	29.227	29.206	29.242
10	32	50	45	42⅓	.181	.234	·251	100	65	84	29.119	29.005	28.910	29.011
11	42	45	45	44	.267	.300	.300	100	100	100	28.689	28.612	28.634	28.645
12	38	46	44	42⅔	.229	.169	.196	100	54	68	28.785	28.763	28.698	28.749
13	34	45	29	36	.155	.130	.160	79	45	100	28.979	29.090	29.274	29.114
14	19	42	32	31	.103	.113	.125	100	42	69	29.444	29.433	29.453	29.443
15	28	47	32	35⅔	.135	.179	.162	88	55	89	29.402	29.280	29.254	29.312
16	41	44	44	43	.257	.289	.289	100	100	100	29.192	29.151	29.153	29.165
17	44	49	45	46	.289	.322	.300	100	92	100	29.159	29.159	29.163	29.160
18	43	47	38	42⅔	.278	.249	.229	100	77	100	29.192	29.112	29.076	29.127
19	40	51	42	44⅓	.203	.245	.222	82	65	83	29.013	28.832	28.796	28.880
20	38	46	35	39⅔	.229	.215	.204	100	69	100	28.775	28.773	28.818	28.789
21	35	39	36	36⅔	.204	.238	.212	100	100	100	28.822	28.843	28.919	28.861
22	32	38	32	34	.181	.229	.143	100	100	79	28.860	28.772	28.784	28.805
23	32	41	36	36⅓	.143	.235	.212	79	91	100	28.784	28.781	28.883	28.816
24	34	42	31	35⅔	.155	.177	.174	79	66	100	28.962	28.927	29.026	28.972
25	32	34	30	32	.181	.196	.167	100	100	100	29.037	29.077	29.223	29.112
26	25	32	22	26⅓	.135	.125	.118	100	69	100	29.330	29.307	29.190	29.276
27	25	32	32	29⅔	.129	.181	.181	93	100	100	28.906	28.698	28.587	28.730
28	32	35	26	31	.181	.183	.144	100	90	100	28.861	29.004	29.066	28.978
29	28	37	32	32⅓	.141	.164	.184	93	76	100	29.104	29.171	29.289	29.188
30	19	37	22	26	.103	.157	.118	100	71	100	29.421	29.395	29.441	29.419
31	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	------
Sums	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	------
Means	------	------	------	36°.29	.176	.196	.193	95	73	92	--------	--------	--------	29.081
Average						.188			87					

THE MONTH OF NOVEMBER, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
30	Cir. St.	10	Cir. St.	00	--------	S W	12	S W	10	S W	6	2	3	48	24	------	----	----	----
90	Cu.	90	Cu.	00	--------	S W	8	N W	14	----	0	2	3	52	16	------	----	----	----
30	Cir. St.	40	Cu.	00	--------	----	0	W	8	----	0	4	2	44	18	------	- --	----	----
90	Cu.	00	--------	00	--------	N W	4	N E	2	----	0	4	3	40	19	------	----	----	----
30	Cir.Cu.	90	Cir. St.	100	Nim.	----	0	S W	6	S	5	3	3	47	26	8 P. M.	----	----	----
50	Cir. St.	100	Nim.	100	St.	----	0	N	5	----	0	2	4	42	20	------	8 P. M.	.22	1 in.
00	--------	100	Cu.	100	St.	----	0	W	13	N W	10	5	5	42	32	------	----	----	----
100	Cu.	100	Cu. St.	100	St.	N W	5	N W	6	----	0	4	3	42	34	------	----	----	----
100	Cu. St.	100	Cu. St.	90	Cu.	N W	3	N W	9	----	0	3	2	42	29	------	----	----	----
90	Cir. St.	100	Cir. St.	100	Nim.	----	0	S W	5	S W	3	2	3	51	40	8:30 P. M.	----	----	----
100	Nim.	100	Nim.	100	Nim.	----	0	----	0	S W	6	2	4	45	36	------	N't.	.34	----
100	Cu.	50	Cir. St.	30	Cir.	N W	11	S W	12	N W	11	3	3	47	31	------	----	----	----
00	--------	60	Cu.	00	--------	N W	6	N W	13	----	0	3	1	45	17	------	----	----	----
20	Cir. St.	60	Cir. St.	00	--------	----	0	----	0	----	0	3	3	43	24	------	----	----	----
100	Cir. St.	50	Cir.	00	--------	----	0	S E	1	----	0	4	2	47	30	------	----	----	----
100	Nim.	100	Nim.	100	Nim.	N E	2	E	3	----	0	3	1	44	40	5 A. M.	----	----	----
100	St.	100	St.	100	St.	----	0	W	2	----	0	1	2	49	42	------	N't.	.55	----
100	St.	90	Cu.	00	--------	W	3	S W	1	S W	1	3	----	47	36	------	----	----	----
100	St.	100	St.	100	St.	----	0	----	0	----	0	----	----	51	37	------	----	----	----
90	Cir.	90	Cu.	100	St.	----	0	----	0	----	0	3	2	49	33	------	----	----	----
100	St.	100	Nim.	100	Nim.	----	0	S E	1	----	0	4	4	39	31	10:30 A. M.	10 P. M.	.15	----
100	Cu. St.	90	Cu.	100	St.	N W	4	N	6	N	3	4	4	39	30	------	----	----	----
10	Cu. St.	5	Cu.	100	St.	N W	5	N W	7	----	0	3	2	41	26	------	----	----	----
60	Cir. St.	100	Cir. St.	00	--------	----	0	N E	4	N W	6	3	4	45	29	Night.	----	----	----
100	Nim.	100	Nim.	00	--------	----	0	N E	4	----	0	3	3	34	20	------	4 P. M.	.10	1 in.
100	St.	100	Cu.	00	--------	----	0	----	0	----	0	4	4	33	17	------	----	----	----
100	Cu. St.	100	Nim.	100	Nim.	N	1	N E	9	N E	8	3	5	32	25	8 A. M.	10 P. M.	.80	7 in.
100	Cu. St.	90	Cu. St.	00	--------	N W	10	N W	2	----	0	4	5	35	24	------	----	----	----
00	--------	80	Cu. St.	00	--------	----	0	----	0	----	0	5	4	38	15	------	----	----	----
100	Cir. St.	50	Cir. St.	50	Cir. St.	S	1	N E	4	----	0	3	4	37	19	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	----	----
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	----	2.16	9
73	--------	80	--------	52	--------	----	--	----	--	----	--	3.17	3.14	43°	27°.3	------	----	----	----

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METEOROLOGICAL OBSERVATIONS FOR

Day of Month.	Thermometer, in Open Air.				Pressure of Vapor, in Inches.			Relative Humidity, or Percentage of Saturation..			Barometer, Reduced to Freezing Point.			
	7 A. M.	2 P. M.	9 P. M.	Daily Mean.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	Mean.
1	29	36	34	33	.142	.191	.175	88	90	89	29.304	29.104	28.934	29.114
2	32	35	33	33⅓	.181	.183	.188	100	90	100	28.594	28.694	28.788	28.692
3	31	33	32	32	.174	.188	.181	100	100	100	28.659	28.672	28.968	28.771
4	27	33	27	29	.147	.188	.111	100	100	75	28.968	28.911	28.994	28.958
5	25	32	30	29	.135	.162	.167	100	89	100	29.056	29.011	29.021	29.029
6	27	33	28	29⅓	.147	.168	.135	100	89	88	29.031	29.016	29.080	29.042
7	25	29	15	23	.135	.123	.086	100	77	100	29.178	29.247	29.312	29.246
8	14	31	30	25	.155	.174	.167	89	100	100	29.271	29.114	28.956	29.114
9	34	35	32	33⅔	.196	.204	.181	100	100	100	28.761	28.671	28.593	28.675
10	31	33	32	32	.174	.150	.162	100	80	89	28.478	28.442	28.504	28.475
11	30	32	25	29	.148	.181	.135	89	100	100	28.747	28.844	29.070	28.887
12	17	29	26	24	.094	.160	.141	100	100	100	29.345	29.422	29.497	29.421
13	21	33	25	26⅓	.096	.131	.135	85	70	100	29.504	29.451	29.334	29.430
14	24	29	25	26	.129	.160	.135	100	100	100	29.101	28.958	29.044	29.034
15	11	20	15	15⅓	.071	.091	.086	100	85	100	29.131	29.098	29.116	29.115
16	19	21	20	20	.103	.113	.108	100	100	100	29.197	29.197	29.234	29.209
17	19	29	21	23	.103	.123	.113	100	77	100	29.221	29.170	29.156	29.182
18	13	19	13	15	.078	.103	.078	100	100	100	29.274	29.297	29.356	29.309
19	14	19	13	15⅓	.082	.103	.078	100	100	100	29.477	29.504	29.394	29.458
20	11	20	19	16⅔	.071	.108	.103	100	100	100	29.421	39.348	29.182	29.317
21	21	23	19	21	.113	.123	.103	100	100	100	28.832	28.598	28.546	28.659
22	15	17	6	12⅔	.086	.094	.057	100	100	100	28.668	28.780	28.839	28.762
23	1	6	3	3⅓	.046	.057	.050	100	100	100	28.948	28.981	28.988	28.972
24	0	9	15	8	.044	.065	.086	100	100	100	29.006	28.942	29.088	28.985
25	9	15	15	13	.065	.086	.086	100	100	100	28.921	28.919	28.948	28.929
26	17	23	11	20⅓	.094	.089	.071	100	72	100	28.914	28.948	28.914	28.925
27	15	26	20	17	.086	.105	.108	100	75	100	28.918	28.974	29.123	29.005
28	10	14	9	11	.068	.082	.065	100	100	100	29.230	29.197	29.191	29.206
29	11	19	12	14	.071	.087	.075	100	84	100	29.221	29.136	29.088	29.148
30	19	22	9	16⅔	.087	.081	.065	84	71	100	29.168	29.196	29.275	29.213
31	9	19	11	13	.065	.087	.071	100	84	100	29.355	29.255	29.239	29.289
Sums	------	------	------	------	------	------	------	------	------	------	--------	--------	--------	--------
Means	------	------	------	21°.29	.081	.131	.112	98	90	98	--------	--------	--------	29.147
Average	------	------	------	------		.108			95		--------	--------	--------	--------

THE MONTH OF DECEMBER, 1878.

CLOUDS.						WINDS.						OZONE.		REGISTERING THERMOM'R.		RAIN AND SNOW.			
7 A. M.		2 P. M.		9 P. M.		7 A. M.		2 P. M.		9 P. M.									
Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Per Cent of Cloud.	Kind.	Direction.	Force.	Direction.	Force.	Direction.	Force.	Day: 7 A. M. to 2 P. M.	Night: 9 P. M. to 7 A. M.	Maximum.	Minimum.	Beginning, Rain or Snow.	Ending, Rain or Snow.	Inches of Rain and Melt'd Snow.	Depth of Snow.
100	St.	100	Cu. St.	100	Cu. St.	N E	4	N E	8	N E	2	5	4	36	28	------	------	----	--
100	Nim.	90	Cu. St.	100	St.	N	2	N W	4	----	0	4	4	35	29	6 A. M.	12 M.	.76	2
100	St.	50	Cu.	00	--------	S E	3	S E	5	----	0	4	3	33	28	------	------	----	--
100	St.	70	St.	100	St.	----	0	----	0	N W	4	3	4	33	22	------	------	----	--
100	Cu. St.	100	Cu. St.	100	St.	----	0	N W	1	----	0	3	4	32	24	N'ht.	------	.15	2
100	Cu. St.	30	Cu.	100	Cir. Cu.	----	0	W	2	W	2	3	3	35	23	------	------	----	--
100	St.	100	Cu.	00	--------	W	1	W	3	----	0	4	3	30	9	------	------	----	--
20	Cir. St.	100	St.	100	Nim.	----	0	S E	3	S E	2	4	4	34	29	3 P. M.	------	----	--
100	Nim.	100	St.	100	Nim.	----	0	S W	5	W	3	4	5	35	28	------	10 P. M.	.24	2
100	St.	100	Cu. St.	100	St.	W	7	N W	10	N W	15	4	5	33	28	------	------	----	--
100	St.	70	Cu.	100	Cu.	W	8	W	9	W	2	4	4	32	13	------	------	----	--
10	Cu.	100	Cu. St.	100	St.	----	0	W	12	W	10	5	4	29	15	------	------	----	--
100	St.	100	Cir. St.	100	Nim.	----	0	W	5	N E	2	4	5	33	20	9 P. M.	------	----	--
100	Nim.	100	Nim.	100	Nim.	N E	7	N E	7	N E	7	6	5	29	9	------	9:30 P. M.	.31	5
60	Cir. St.	90	Cir. Cu.	100	St.	----	0	----	0	----	0	5	5	21	9	------	------	----	--
100	Nim.	100	Nim.	100	St.	----	0	----	0	----	0	4	5	21	17	------	Snow Sq'lls.	----	--
100	St.	100	Cir. St.	100	Nim.	----	0	----	0	----	0	5	4	29	10	8 P. M.	------	----	--
100	Nim.	90	Cir.	00	--------	S W	5	S W	6	----	0	4	4	19	8	------	------	----	--
100	Nim.	100	Nim.	100	St.	S W	3	S W	7	S W	4	5	5	20	9	------	------	----	--
100	St.	90	Cir. Cu.	100	St.	S W	1	S W	4	S E	2	4	6	21	11	------	------	----	--
100	Nim.	100	Nim.	100	Nim.	----	0	N E	5	E	2	5	5	24	15	------	------	----	--
100	St.	100	Nim.	100	St.	----	0	S W	6	S W	10	4	5	19	-2	------	10 P. M.	.66	9
50	Cir.	90	Cir. Cu.	100	Nim.	S W	10	S W	10	S W	9	5	6	6	-1	10 P. M.	------	----	--
100	Nim.	100	Nim.	100	Nim.	S W	10	S W	12	S W	2	5	5	15	0	------	9 P. M.	.15	2
100	Nim.	100	Nim.	100	Nim.	W	4	W	7	W	9	6	5	15	9	Snow Sq'lls.	------	----	--
100	Nim.	90	Cu. St.	100	Nim.	S W	4	S W	6	S W	1	5	6	23	9	Snow Sq'lls.	------	----	--
100	St.	100	Nim.	100	Nim.	----	0	W	5	S W	8	6	6	26	9	Snow Sq'lls.	------	----	--
100	Cu. St.	100	Cu. St.	50	Cir. St.	----	0	S W	6	S W	7	5	5	14	5	------	------	----	--
100	Cir. St.	90	Nim.	20	Cir. St.	S W	4	----	0	----	0	4	6	19	10	Snow Sq'lls.	------	----	--
100	Cu.	100	Cu. St.	60	Cu.	W	2	W	6	W	3	4	5	23	4	------	------	----	--
90	Cir. St.	100	St.	00	--------	----	0	S W	4	----	0	6	7	19	3	------	------	----	--
----	--------	----	--------	----	--------	----	--	----	--	----	--	----	----	------	------	------	------	2.27	22
94	--------	90	--------	82	--------	----	--	----	--	----	--	4.55	4.74	26°	14°	------	------	----	--

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ABSTRACT OF METEOROLOGICAL TABLES FOR 1878.

MONTHS—1878.	Barom. Reduced to 32° F.	Temp. in Open Air.	Mean of Max. Temp.	Mean of Min. Temp.	Per Cent of Cloud.	Relative Humidity.	Rain and Melted Snow.	Depth of Snow in Inches.
January	29.123	29°.11	38°.00	18°.70	76	89	1.12	13¾
February	29.026	28°.07	38°.00	17°.50	56	89	2.74	14¼
March	29.027	40°.90	49°.30	33°.20	72	83	3.12	1
April	28.874	50°.55	62°.40	46°·00	59	69	3.76	--------
May	29.020	54°.57	66°.97	44°.80	54	61	3.44	--------
June	29.030	64°.08	75°.70	51°.00	45	73	3.15	--------
July	29.084	73°.04	83°.00	61°·20	37	68	2.96	--------
August	29.009	70°.15	84°.00	55°.31	40	74	1.85	--------
September	29.156	63°.15	74°.30	49°.90	45	78	3.41	--------
October	29.080	48°.33	58°.00	36°.00	54	76	1.99	1
November	29.081	36°.29	43°.00	27°.30	68	87	2.16	9
December	29.147	21°.29	26°.00	14°.00	89	95	2.27	22
Average	29.054	48°·29	58°.22	37°.91	58	78	--------	--------
Total	--------	--------	--------	--------	--------	--------	31.19	61

Thunder storms for the year,—24.

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